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EMPLOYEE ATTITUDES OF THE
ORGANIZATIONAL CULTURE:
ASSESSMENT OF A TQM
IMPLEMENTATION PROCESS

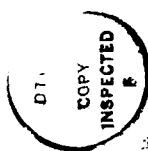
THESIS

Thomas J. Stout, GS-11

AFIT/GLM/LSQ/90S-57

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EMPLOYEE ATTITUDES OF THE ORGANIZATIONAL CULTURE:
ASSESSMENT OF A TQM IMPLEMENTATION PROCESS

THESIS

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Logistics Management

Thomas J. Stout, B.A.

GS-11

September 1990

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Acknowledgements

I am deeply indebted in this effort to all those in Aeronautical Systems Division who shared their knowledge, time, and survey data. I hope that I have returned some benefit to you in your search for continuous improvement of Total Quality Management. Additional thanks go to my thesis "team" of Mr. Virgil Rehg, Mr. Dick Di Lorenzo, and Dr. Rita Wells for their patience and guidance in seeing this research from concept to fruition. Also, I extend special appreciation to those members of the AFIT faculty who make the personal sacrifice to avail themselves to students. Your efforts do not go unappreciated.

With that said, I would be remiss not to claim sole responsibility for the content and quality of the research and the manuscript.

On a personal level, I have many people to thank for their support. My sincerest gratitude and eternal friendship goes to Captain Esperanza Flores for providing me encouragement, confidence, and humor throughout my AFIT stay. Finally, my love and thanks to my parents, family, and friends who keep me close at heart when we are apart.

Thomas J. Stout

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List of Definitions of Technical Terms

1. Bivariate analysis. Statistical analysis in which two variables are involved.
2. Civilian grade. A class division of authority and pay of the non-military government work force. For this study, members of the General Schedule (GS) and Senior Executive Service (SES), part of a demographic variable with military rank, used as an independent variable.
3. Composite variable. A descriptive term meaning a variable composed of other variables. Used to refer to the variables resulting from the reduction by combination of the criterion variables.
4. Control variable. Factors other than the independent variable which are present but assumed not to have influence on the dependent variable.
5. Criterion variable. A key variable that is of primary concern, against which the importance of other variables are judged. In this study, the 26 variables measuring attitudes about the culture were considered of primary concern.
6. Demographic variable. A variable to obtain descriptive information about the respondent, like education level completed. Demographic variables were used in two ways: as independent and control and control variables.
7. Dependent variable. The variable that is to be predicted about in the future.
8. Independent variable. The variable that is to be used in calculating the prediction. The relationship to the dependent variable may be correlative or causal. This study is designed only for correlation analysis.
9. Military rank. A class division of authority and pay in the armed forces. For this study, Air Force officer and enlisted classes, part of a demographic variable with civilian grade, used as an independent variable.
10. Multiple prediction. Prediction of correlation based on multiple regression.
11. Multivariate analysis. Statistical analysis in which more than two variables are involved.
12. Univariate analysis. Statistical analysis in which only one variable is involved.

List of Definitions of Technical Terms (Continued)

13. Quality culture. Those aspects of an organization's culture which affect the organization's implementation of, or approach to, quality.

14. Statistically significant difference. Differences resulting from statistical tests which have alpha values (probability of rejecting a true hypothesis) below a pre-established level. Most often, and for this study, the significance level is an alpha value less than .05.

Abstract

This study investigated whether a survey of employee attitudes of the organizational culture yielded a worthwhile assessment of TQM process implementation. Given the assumption of TQM implementation requiring cultural transformation, the culture should reflect the progress of TQM implementation. A literature search indicated attitudes should differ among groups of organizational members. Data was extracted from a TQM-familiar, Air Force organization's survey of 170 members. Through data reduction, nine composite variables of quality culture and three variables of TQM were identified. Anova, t-tests, and regression analyses using various combinations of groups and variables were performed. Statistically significant differences were found between supervisors and non-supervisors regarding cultural variables Positive Outlook and Work Enhancement. GS-12s differed from GS1-7s Administrative and GS5-11s regarding the variable Management. The variables Organizational Communication, Help Individuals, and Education had predictive value to various TQM variables. Areas for improvement of TQM implementation were identified, but results were considered mixed. Confounding factors were discussed and further research was recommended.

EMPLOYEE ATTITUDES OF THE ORGANIZATIONAL CULTURE:
ASSESSMENT OF A TQM IMPLEMENTATION PROCESS

I. Introduction

General Issue

The decline in US industrial competitiveness, at home and in world markets, has caused great alarm and discussion over the last decade (Engen, 1990:3). The annual rate of increase in productivity, which had been around three percent following World War II, dropped to one percent in the 1970s -- among the lowest of major industrialized countries (Brownlee, 1990:22). At the same time, other countries, most notably Japan and Germany, aggressively pursued international competition for world markets (Brownlee, 1990:22; Handfield, 1989:83). An MIT study of industry captured the gravity of what many consider a national challenge, "Wrenching changes at all levels of the organization are necessary if American corporations are to keep pace with international competition, the increasing sophistication of consumers throughout the world, and rapid changes in technology" (quoted in ASD pamphlet, p.4). Besides the obvious economic challenge to US industry, the mounting international competition represents a threat to the US military.

The US military faces the same organizational challenges as economic entities, in addition to the challenge of maintaining national security. Engen argues that the decline in the manufacturing sector of the economy undermines both economic and military strength, thereby endangering national security (Engen, 1990:2). His point is supported by the results of a recent Business Week/Harris Poll of Japanese public opinion which revealed, "that a plurality (43%) expect their country to eventually replace America as the world's leading economic and political power, and 52% want Japan to rely less on the US for defense" (Neff, Dec 1989:62). A similar poll of American public opinion was equally revealing, "By a stunning 3-1 margin, the respondents named Japan's economic challenge as a greater threat to America's future than the Soviet military" (Neff, Aug 1989:47). In addition to strategic concerns, the military confronts the operational constraints of: a shrinking industrial base; increasing international competition in defense products; declining defense budgets; and the cost of poor quality (ASD pamphlet, p.4). In response to these myriad pressures military organizations and private corporations have investigated and tried innovations to improve productivity and competitiveness.

In looking at the Japanese experience for insights into their success, American managers discovered that quality concepts, introduced by American's over 40 years ago, were

the key factor (Handfield, 1989:79; Sheinberg, 1989:1). Many companies have taken action to adopt these "innovations", and various names are used to describe their programs, but Total Quality Management (TQM) is perhaps most broadly recognized (Engen, 1990:3). TQM began for the Department of Defense (DoD) in March 1988 when the Secretary of Defense, Frank Carlucci, signed the "Department of Defense Posture on Quality" letter (Peterson, 1990:18; Springs, 1989:33). The letter set forth the main focus of TQM as a commitment to quality and continuous improvement (Peterson, 1990:18). TQM embodies a philosophy of diffusing quality concepts throughout all levels of an organization to all members. Everyone is responsible for pursuing quality as an integral part of daily activities and as an organizational objective (Brownlee, 1990:27). Individual agencies within the DoD have attempted various means of implementing TQM and of evaluating the success of their implementation strategies (Springs, 1989). Generally these evaluations have focused on quantitative measures such as hours of training, number of quality teams formed, or dollar savings resulting from quality actions (Brownlee, 1990:28; Whitten, 1989:280,284; Baldwin, 1990:80). Though of interest, these measures fail to address the more fundamental issue of whether TQM has become part of the prevailing organizational culture.

After decades of obscurity promoting radical changes in American management methods, quality devotees have recently

seen their ideas widely publicized and put into practice (Brownlee, 1990:24; Kearns, 1989:61; Walton, 1988:16-20).

Foremost among the resurgent ideas is the dictate that management must lead a metamorphosis of the organization, so that a new culture centered on quality emerges. Each author expresses it differently, but the main tenets of management leadership and quality culture are common. For example,

Transformation of American style of management is not a job of reconstruction, nor is it revision. It requires a whole new structure, from foundation upward (Deming, 1986:ix).

The 1980s saw a complete revolution in the quality business...senior managers began to realize that quality is not a technical add-on--that it is part of the fabric of the company and something that they must take charge of (Crosby in Karabatsos, 1989:23).

The changes businesses are being forced to make merely to stay competitive--improving quality, increasing speed, adopting a customer orientation--are so fundamental that they must take root in a company's very essence, which means in its culture... Cultural change must come from the bottom, and the CEO must guide it (Dumaine, 1990:127).

The concept of culture for an organization is not new, but the term remains somewhat elusive because it is often discussed in the academic jargon of sociologists and organizational theorists (see Jennings and Lindsey, 11; Duncan, 1989:229). Though there is merit in these descriptions, they lack the clarity and practicality managers need. On the other hand, most non-academics fail to define the term or use vague descriptions, "a cultural transformation is a change in the hearts and minds of the

workers..." (Dumaine, 1990:127). Sheinberg finds the middle ground in what she calls cultural systems, "This cultural system is each organization's individual design for living or blueprint for behavior. The cultural system includes the organization's knowledge and beliefs, values, language, and behavioral expectations" (Sheinberg, 1989:3). In other words, the organization's culture influences how people interact with each other and their work place. She concludes, "An organization's cultural system must be consistent with, and integrate into, the necessary behaviors for Quality (sic)" (Sheinberg, 1989:3).

It follows from Sheinberg's logic that peoples' attitudes will reflect the consonance between an organization's culture and its quality initiatives. The culture influences the behaviors, or "hearts and minds" if you will, that are necessary to make quality happen. Put simply, "Quality is first a frame-of-mind, an attitude" (Sheinberg, 1989:3). Thus to measure the success of a quality initiative like TQM, one can start by questioning organization members about their attitudes toward the company culture and quality. Mounting evidence indicates that the attitudes between top management, middle management, and line workers are disparate, which argues against there being a uniform culture supportive of quality. One recent study found that, "at each level, employees think like their peers (across industry groups) and differently

from those at other levels in the organization (which) indicates that organizations will encounter difficulties in attempting to discuss or improve quality" (Derrick, 1989:27). Fortune and Business Week report on the disillusionment and isolation of middle managers as their traditional authority and opportunities erode (Farnham, 1989; O'Reilly; 1990:38; Byrne:80). And line workers remain skeptical about employee involvement (EI) teams without corresponding "no lay-off" policies and greater participation in management decision-making (Hoerr, 1989:56). These reports, and the estimate by one consulting firm that only 45 percent of large employers make regular use of worker opinion surveys (Farnham, 1989:57), substantiate Feigenbaum's observation that, in some areas, top management's quality efforts are "cheerleading rather than implementation" (Feigenbaum in Karabatsos, 1989:23).

Specific Problem

The quality literature, though consistent with advice on what to change, is less decided about how to measure, control, and continuously improve the implementation process of quality initiatives. With no accepted guidelines, appraisals of quality improvement efforts generally focus on simple, countable measures like the number of improvement teams formed or the dollars saved. Top management, eager to meet its obligation as a champion of quality, uses these numbers, or less, to proclaim quality implementation a

success (see Brownlee, 1990:28). Unfortunately, such measures fail to account for how well the quality initiatives have truly taken root in the organization. If the rank and file members are skeptical of the initiatives, or of successful implementation, the end result of the well-intentioned publicity is a loss of credibility.

Because quality improvement efforts are predicated on changing the organizational culture to support quality, the organizational culture offers better measures of the success of the implementation process. In particular, a change in the organizational culture not only includes changing peoples' attitudes about quality, but also changing a myriad of factors which result in changing peoples' attitudes about quality. The most direct measure of the quality implementation process, then, is to assess the attitudes of the people relative to quality and the organizational culture. Therefore, attitude surveys can serve as an indicator of the success of implementation, and also identify groups and areas where assistance is needed. For example, management may believe communication flows adequately in the organization, but line workers may not. Communication is a key cultural factor affecting TQM. An attitude survey revealing this discrepancy between managers and line workers indicates incomplete TQM implementation and a need for remedial action between the groups.

Some of the major Air Force organizations have been actively implementing TQM for over two years and they are now attempting self-assessment. In all likelihood, their efforts have had mixed results due to the complexity of the task and the natural resistance people have to change. This research aims to use an attitude survey of an Air Force organization actively involved in TQM implementation to test whether groups within that organization differ in their attitudes toward the quality culture of their organization. Additional tests will be whether organizational groups differ in their attitudes to TQM and whether descriptive variables can be used as predictors of attitudes to TQM. In so doing, the organization studied may gain insight which will allow them to improve their implementation process.

As military organizations struggle to implement TQM, they must remember that the hallmark of TQM is continuous improvement (Prowse, 1990:5). Therefore, TQM implementation never really ends and they must keep searching for new appraisal methods and honest indicators of relative success. This research effort attempts to contribute to this greater need for improvement.

Formulation of Null Hypotheses

From the outset of data collection, the intent was to use demographically demarcated groups and assess their attitudes toward aspects of the organization's quality culture and TQM. From this intent, five basic hypotheses

were developed. During data collection, specific measures to assess the quality culture and TQM evolved. Specifically, nine composite variables related to quality culture and three dependent variables regarding TQM were identified. These variables allowed for the restatement of the basic hypotheses into a set of more refined, precise hypotheses suitable for individual statistical testing. Therefore, these derived hypotheses were added as subhypotheses to the basic hypotheses and were used throughout the research.

Null Hypotheses

Null Hypothesis Hol. There will be no statistically significant difference between supervisory and non-supervisory organizational members with regard to their attitudes about the organization's quality culture.

Hola. There will be no statistically significant difference between supervisory and non-supervisory organizational members with regard to their attitudes about the composite variable Management.

Holb. There will be no statistically significant difference between supervisory and non-supervisory organizational members with regard to their attitudes about the composite variable Goals.

Holc. There will be no statistically significant difference between supervisory and non-supervisory organizational members with regard to their attitudes about the composite variable Positive Outlook.

Hold. There will be no statistically significant difference between supervisory and non-supervisory organizational members with regard to their attitudes about the composite variable Help Individuals.

Hole. There will be no statistically significant difference between supervisory and non-supervisory

organizational members with regard to their attitudes about the composite variable Employee Involvement.

Holf. There will be no statistically significant difference between supervisory and non-supervisory organizational members with regard to their attitudes about the composite variable Trust.

Holg. There will be no statistically significant difference between supervisory and non-supervisory organizational members with regard to their attitudes about the composite variable Organizational Communication.

Holh. There will be no statistically significant difference between supervisory and non-supervisory organizational members with regard to their attitudes about the composite variable Personal Rewards.

Holi. There will be no statistically significant difference between supervisory and non-supervisory organizational members with regard to their attitudes about the composite variable Work Enhancement.

Null Hypothesis Ho2. There will be no statistically significant difference among organizational members, sorted by military rank or civilian grade, with regard to their attitudes about the organization's quality culture.

Ho2a. There will be no statistically significant difference among organizational members, sorted by military rank or civilian grade, with regard to their attitudes about the composite variable Management.

Ho2b. There will be no statistically significant difference among organizational members, sorted by military rank or civilian grade, with regard to their attitudes about the composite variable Goals.

Ho2c. There will be no statistically significant difference among organizational members, sorted by military rank or civilian grade, with regard to their attitudes about the composite variable Positive Outlook.

Ho2d. There will be no statistically significant difference among organizational members, sorted by military rank or civilian grade, with regard to their attitudes about the composite variable Help Individuals.

Ho2e. There will be no statistically significant difference among organizational members, sorted by military

rank or civilian grade, with regard to their attitudes about the composite variable Employee Involvement.

Ho2f. There will be no statistically significant difference among organizational members, sorted by military rank or civilian grade, with regard to their attitudes about the composite variable Trust.

Ho2g. There will be no statistically significant difference among organizational members, sorted by military rank or civilian grade, with regard to their attitudes about the composite variable Organizational Communication.

Ho2h. There will be no statistically significant difference among organizational members, sorted by military rank or civilian grade, with regard to their attitudes about the composite variable Personal Rewards.

Ho2i. There will be no statistically significant difference among organizational members, sorted by military rank or civilian grade, with regard to their attitudes about the composite variable Work Enhancement.

Null Hypothesis Ho3. There will be no statistically significant difference between or among groups, in any of the independent or control variables addressed by this study, and the dependent variables pertaining to TQM.

Ho3a. There will be no statistically significant difference between or among groups, in any of the independent or control variables addressed by this study, and the dependent variable TQM1, Understand TQM Concept.

Ho3b. There will be no statistically significant difference between or among groups, in any of the independent or control variables addressed by this study, and the dependent variable TQM2, TQM Improves Work Place.

Ho3c. There will be no statistically significant difference between or among groups, in any of the independent or control variables addressed by this study, and the dependent variable TQM3, TQM Leads to Positive Results.

Null Hypothesis Ho4. None of the variables pertaining to the organizational quality culture have predictive value

in the multiple prediction of the dependent variables pertaining to TQM.

Ho4a. None of the composite variables have predictive value in the multiple prediction of the dependent variable TQM1, Understand TQM Concept.

Ho4b. None of the composite variables have predictive value in the multiple prediction of the dependent variable TQM2, TQM Improves Work Place.

Ho4c. None of the composite variables have predictive value in the multiple prediction of the dependent variable TQM3, TQM Leads to Positive Results.

Null Hypothesis Ho5. None of the the independent and control variables have predictive value in the multiple prediction of the dependent variables pertaining to TQM.

Ho5a. None of the the independent and control variables have predictive value in the multiple prediction of the dependent variable TQM1, Understand TQM Concept.

Ho5b. None of the the independent and control variables have predictive value in the multiple prediction of the dependent variable TQM2, TQM Improves Work Place.

Ho5c. None of the the independent and control variables have predictive value in the multiple prediction of the dependent variable TQM3, TQM Leads to Positive Results.

II. Literature Review

Introduction

This chapter summarizes relevant literature pertaining to the subjects of quality and TQM as a background for the analysis which follows in chapter 4. The specific goals were to provide an understanding of various quality philosophies as the historical foundation of TQM and to explain the fundamental features of TQM. The objective was to clarify the TQM philosophy as a prerequisite for analyzing the results of an organizational climate survey of an organization involved in TQM.

Definitions of Quality

A fundamental starting point for the understanding of any subject is with the definition of terms and concepts. The subject of quality is no exception because its essence is so mercurial; it is both objective and subjective. On one hand it can be measured, as in conformance to requirements, but on the other it defies description, as in the statement "I know it when I see it". This contradiction led Garvin to identify five key approaches to defining quality which reflect different, sometimes conflicting, perspectives (Garvin, 1988:40). Vansina summarized the five approaches in the following manner (Vansina, 1990:62).

1. The transcendent approach of philosophy: Even though quality cannot be defined, you know what it is.

2. The product-based approach of economics: Quality refers to the quantity of desired ingredients in a product.
3. The user-based approach of economics, marketing and operations management: Quality is the capacity to satisfy customers' wants.
4. The manufacturing-based approach: Quality means conformance to requirements.
5. The value-based approach of operations management: Quality is the degree of excellence at an acceptable price and the control of variability at an acceptable cost.

Garvin contends that the different functional groups within an organization adopt a definition of quality consistent with their roles and duties. Marketing people may take a user-based approach and engineering people a product-based approach. Though both groups think they comprehend and pursue "quality", each has a separate set of ideas about the meaning of the word. Garvin supports this argument by separating the concept of quality into basic elements which he calls the eight dimensions of quality (Garvin, 1989:49). The eight dimensions are: performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality (Garvin, 1989:49-60; Garvin, 1984:25-43; Springs, 1989:5-6). Though each primary approach to quality is multi-dimensional, each has an implicit focus on different dimensions: the product-based approach on performance, features, and durability; the user-based approach on aesthetics, serviceability, and perceived quality; and the manufacturing-based approach on

conformance and reliability. The result is a definition of quality reflecting the point of view of the particular functional group.

The divergence of approaches to quality must be recognized and exploited by management, especially those trying to instill a total-quality philosophy. "All these approaches focus on one particular aspect that may or may not be relevant to a particular business. Therefore, it is essential that top management work through its own divergent views on quality to arrive at a common definition for its specific business" (Vansina, 1989:62). Management makes the strategic choice on how to integrate the approaches into a systems view of quality management. This system view directs the effort to continually improve at the functional levels along the lines of the eight dimensions.

Three Quality Experts

There are three widely recognized experts in the field of quality whose philosophies on quality management form the core of the discipline: W. Edwards Deming, Joseph M. Juran, and Philip Crosby (Lowe and Mazzeo, 1986:22; Handfield, 1989:79-80; Brownlee, 1990:26). All provide a prescription of fundamental actions to guide organizations seeking to improve quality; yet they are not merely clones of each other. Their advice differs due to the approach each takes to defining quality and to the emphasis each places on techniques of achieving quality. In the past, the experts'

differences have led to a pedagogic division amongst quality practitioners and to a misleading, programmatic approach to quality improvement. Commenting on negative quality-related developments of the 1980s, Crosby noted, "There was a lot of useless intramural quarreling among the quality people about which techniques are the most effective, without recognizing that you really need a complete quiver of arrows" (Karabatsos, 1989:22). A comparative overview of their philosophies will be discussed before detailing their individual guidelines to quality improvement and their key similarities.

Comparative Philosophies

Crosby's definition of quality is "conformance to requirements" (Crosby, 1979:15). This definition fits Garvin's manufacturing-based approach because it assumes the requirements are given, so quality is an internal measure of performance to a standard. Juran objects to this view by noting that a dangerous product made to requirements would not be useable, therefore, it would not be a quality product. Thus Juran defines quality as "fitness for use" (Juran, 1974:2-2). This is an outward, user-based approach directed at the customer's wants and needs. Garvin notes that the subjective nature of this view of quality makes it difficult for suppliers to make operational (Garvin, 1989:43). Deming's view blends Garvin's three approaches: product-based, user-based, and manufacturing-based. Deming

describes quality as a predictable degree of uniformity and dependability, at low cost and suited to the market (Lowe and Mazzeo, 1986:23). He recognizes the importance of the customer's requirements, but his basic philosophy is that quality and productivity follow from variability reduction in processes (Oakland, 1989:286). Deming stresses the minimization of variation by distinguishing common causes of variation from special causes of variation, and then controlling the former and removing the latter (Modarress and Ansari, 1989:58). The use of statistical methods in this manner is known equally as statistical quality control (SQC) or statistical process control (SPC).

Lowe and Mazzeo describe each experts' philosophy according to the predominate underlying theme of their quality improvement methodology (Lowe and Mazzeo, 1986:25). In the opinion of Lowe and Mazzeo, Crosby's approach is top-down because he emphasizes first attaining a new management quality commitment and culture. On the other hand, Juran's focus on the "breakthrough experience" of project-by-project implementation operates at the middle management level. Lowe and Mazzeo admit Deming's methodology includes top-management commitment as well as mid-management involvement, however, they feel Deming's emphasis on SPC tends to make his approach a bottom-up process. His call for participative management practices and development of

prideful workers are seen as other indicators of a factory-floor orientation (Lowe and Mazzeo, 1986:24).

The differences in the ideologies of Crosby, Juran and Deming are similar to the differences in the approaches to defining quality outlined by Garvin. The ideologies, like the definitions, can be thought of as complements for each offers unique insights the others do not. Lowe and Mazzeo conclude that, "Any organization would benefit by using the concepts of all three experts to provide a complete strategy for quality improvement. However, all of their major concepts must be clearly understood and related to each other to assure an integrated approach to quality improvement" (Lowe and Mazzeo, 1986:25). That the approaches of the three experts are compatible is evidenced by common beliefs, "that there are no short-cuts to quality, no quick fixes, and that improvement requires full commitment and support from the top, extensive training and participation of all employees" (Oakland, 1989:281).

Crosby. Crosby's methodology for quality improvement reflects his orientation toward a top-down approach. He begins by outlining the new philosophy which management must accept, put in practice, and communicate to the workers. Establishing this new philosophy is a precondition for quality improvement. He calls this philosophy the "Absolutes of Quality Management" and it consists of four topics, as seen in Table 1.

Table 1
Crosby's Absolutes of Quality Management

-
1. Definition - conformance to requirements.
 2. System - prevention.
 3. Performance standard - zero defects.
 4. Measurement - price of nonconformance.

(Lowe and Mazzeo, 1986:24)

Crosby starts with the definition of quality as conformance to requirements and ends with the corollary that nonconformance measures the cost of quality (Oakland, 1989:281). In between, he sets forth two principles opposed to the traditional quality methods of after the fact inspection and acceptable defect rates. Crosby notes that the system creating quality must be prevention oriented, instead of relying on defect detection. Therefore, he contends, the system can not function properly with the notion of unavoidable, acceptable defects. Instead the performance standard which everyone in the organization must strive to achieve is "zero defects". Crosby also promotes measuring the price of nonconformance as a way to convince those who view quality as a cost that "quality is free" and as a way to select improvement projects (Lowe and Mazzeo, 1986:23). With this framework established Crosby elaborates a 14 step prescription of actions for management to achieve ongoing quality improvement (Table 2).

Table 2

Crosby's 14 Steps to Quality Improvement

-
1. Make it clear that management is committed to quality.
 2. Form quality improvement teams with representatives from each department.
 3. Determine where current and potential quality problems lie.
 4. Evaluate the cost of quality and explain its use as a management tool.
 5. Raise the quality awareness and personal concern of all employees.
 6. Take actions to correct problems identified through previous steps.
 7. Establish a committee for the zero defects programme.
 8. Train supervisors to actively carry out their part of the quality improvement programme.
 9. Hold a 'zero defects day' to let all employees realize that there has been a change.
 10. Encourage individuals to establish improvement goals for themselves and their groups.
 11. Encourage employees to communicate to management the obstacles they face in attaining their improvement goals.
 12. Recognize and appreciate those who participate.
 13. Establish quality councils to communicate on a regular basis.
 14. Do it all over again to emphasize that the quality improvement programme never ends.

(Oakland, 1989:282)

Juran. Juran emphasizes a very proactive role for management regarding quality. Quality is viewed as a management function equal to finance or marketing. So top

management sets strategic goals related to quality and customer satisfaction, and these objectives are translated into annual operating goals for all levels of management. Responsibility for achieving the quality goals are clearly assigned and are largely the province of management, because they control 85 percent of the problems. By placing quality on equal footing with other functional objectives, in the formal planning system, the organization will respond to achieve the objectives. Similar to Crosby, Juran also views the cost of poor quality as the main quality measurement tool and advocates using it to identify improvement projects.

Juran emphasizes that in addition to the symptom-solution approach of SPC, management must find and remove the root cause of deviations. SPC highlights the symptom of an out of control process and usually the immediate solution is straightforward, but the true source of the problem is hidden. For example, a worker can monitor that out-of-round holes are due to a worn drill bit, but not that drill bits are purchased from a new vendor. Thus the solution rests not with replacing the worn drill bit, but in recognizing the high usage rate of drill bits and tracking the problem to the new vendor. In Juran's view management, not the worker, has the information and perspective to resolve such problems. Juran's method for quality improvement is summarized in Table 3.

Table 3

Juran's 10 Steps to Quality Improvement

1. Build awareness of the need and opportunity for improvement.
2. Set goals for improvement.
3. Organize to reach the goals.
4. Provide training.
5. Carry out projects to solve problems.
6. Report progress.
7. Give recognition.
8. Communicate results.
9. Keep score.
10. Maintain momentum by making annual improvement part of the regular system and processes of the company.

(Oakland, 1989:289)

Deming. Deming concurs that management has most of the responsibility for solving problems, but he emphasizes the individual's role in controlling and improving the process to satisfy the next-in-line customer. Management's duties are to empower the worker with training and participation, remove impediments, and take action on quality improvements. Deming recognizes that quality is built in at the "shop-floor", so the management imperative is to create the necessary environment for quality to flourish. Purchasing buys material based on quality and cost, design engineers work with manufacturing engineers to improve product

quality, and personnel specialists think in terms of processes and customers. In short, management instills the quality attitude throughout the organization and SPC provides the tools for quality performance. Deming denounces the use of cost of quality as a measurement tool because it misses the most important cost of customer dissatisfaction. Also he objects to "zero defects" as statistically-naive sloganeering and to Juran's implied management by objectives (MBO) as counter to continuous improvement (Walton, 1986:67,90).

Table 4

Deming's 14 Points for Management

-
1. Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs.
 2. Adopt the new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.
 3. Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.
 4. End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust.
 5. Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.
 6. Institute training on the job.

Table 4 (Continued)

7. Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job. Supervision of management is in need of overhaul, as well as supervision of production workers.
8. Drive out fear, so that everyone may work effectively for the company.
9. Break down the barriers between departments. People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service.
10. Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships, as the bulk of the causes of low quality and low productivity belong to the system and thus lie beyond the power of the work force.
- 11a. Eliminate work standards (quotas) on the factory floor. Substitute leadership.
- 11b. Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership.
- 12a. Remove barriers that rob the hourly worker of his right to pride of workmanship. The responsibility of supervisors must be changed from sheer numbers to quality.
- 12b. Remove barriers that rob people in management and in engineering of their right to pride in workmanship. This means, inter alia, abolishment of the annual merit rating and of management by objective.
13. Institute a vigorous program of education and self-improvement.
14. Put everybody in the company to work to accomplish the transformation. The transformation is everybody's job.

(Deming, 1982:23-24)

Key Similarities

Despite some differences in their philosophies, the three experts agree on fundamental target areas and propositions for improving quality. The most common target areas are management leadership, empowering workers, and removing barriers. By making changes in these areas directed at (1) improving the product by improving the process that makes the product and at (2) ongoing improvement throughout the organization, an organization can achieve improved quality (Lowe and Mazzeo, 1986:22).

Management Leadership. Based on the application of the Pareto principle, the underlying belief is that few problems are under the workers' power to resolve, but most problems are under managements' power to resolve. Consequently, management can achieve improved quality primarily through its own actions. Deming brings this point home by referring to his 14 points as "obligations of management", three of which are expressly applicable: (1) Create constancy of purpose for improvement of product and service (2) Adopt the new philosophy of refusing to allow defects (14) Put everybody in the company to work on the transformation (Table 4). Similarly, Crosby states four "absolutes of quality management" and follows with these specifics from his own 14 point improvement process: (1) Management commitment (13) Quality councils (Table 1). Juran sees management as the quality council and steering arm of his

breakthrough process, intimately involved at all levels in quality projects.

Empowering Workers. The most common aspect of this area is training but it includes other features such as recognition and participation. In regards to training, Deming emphasizes technical areas like statistical techniques (point 6) and new skills (point 13) (Walton, 1986:68,84). Juran's concern is quality management practices and problem-solving skills, while Crosby's focus is the improvement process (Lowe and Mazzeo, 1986:23). On the subject of recognition, Crosby and Juran make a point of recognizing groups and individuals for participating in the improvement process. Deming's method is stated less directly but is more encompassing. By enlightened leadership (point 7), a non-threatening environment (point 8), and proper productivity measures (point 11) people will be encouraged to participate and excel for their own self-worth.

Removing Barriers. All three feel that management has the responsibility to eliminate the sources of problems. Deming urges the removal of all barriers to pride in workmanship (point 12) and the removal of other restrictions such as poor communication (point 9) and negative symbols (point 10). These barriers, and poor training, are usually the cause of process variation. Juran sees problems as chronic or sporadic and consisting of the trivial many and

the important few. Consistent with his "breakthrough philosophy", he advocates concentrating foremost on the chronic, important few. Crosby offers his error cause removal (point 11) as his step to achieve zero defects.

Systems Approach to Quality

From the writings of the above cited three experts, came the realization that an integrative, systems approach to quality was needed. Though quality improvement gains were made by the piecemeal application of their prescriptions, the full potential of their ideas was not realized. In the U.S. the traditional concept of quality, as a technical subject only for manufacturing, was slow to change. Additionally, many firms seeking to improve quality discovered that implementation of the new concepts was uneven, "many quality programs in many companies are quality improvement islands without bridges--separate, unconnected initiatives" (Feigenbaum in Karabatsos, 1989:22). This led to the emergence of the idea of "total quality control", which means an effective system for integrating the quality development, quality maintenance, and quality improvement efforts of the various groups in an organization. Armand V. Feigenbaum is largely credited for coining the term and advancing the concept. The underlying ideas should look familiar as those of the experts, but this restatement countered the misapplication of their guidelines as solely for improvement. "Total quality" expressed the company-wide

application of quality and the totality of definitions and dimensions of the word: quality.

Total Quality Management Defined

Though the term "total quality control" was more descriptive and active than quality improvement, it too carried a negative connotation. The word "control" was too reminiscent of "statistical process control". A more general term was needed to discuss the managed pursuit of quality without implying regulation of a process or statistics. Thus the term "total quality management" (TQM) evolved as encompassing all the corporate and individual activities involved in sustaining quality products and services (Pfau, 1989:17). TQM is a management philosophy which seeks to improve quality and productivity in order to strategically compete for market share. Oakland refers to the strategic aspects when he writes, "Total quality management (TQM) is an approach to improving the effectiveness and flexibility of businesses as a whole. It is essentially a way of organizing and involving the whole organization; every department, every activity, every single person at every level" (Oakland, 1989:14).

Components of TQM

The unifying feature of the management philosophy of TQM is that it entails a system approach. Walter E. and Roger E. Breisch even go so far as claiming that, "Total quality

management (TQM) is a system. It can, and should, be studied and understood as a system" (Breisch and Breisch, 1990:49). They view TQM as the overlapping of the subsystems of employee involvement, focus on customers, and tools of quality. "Total quality management is a management system based on employee involvement focused on customers that uses the tools of quality" (Breisch and Breisch, 1990:50). Badiru also takes a systems view, "A systems approach to total quality management facilitates an integrated awareness of the importance of quality throughout an organization. A system is a collection of interrelated elements working together synergistically to achieve a common goal" (Badiru, 1990:33). Pfau includes a "system approach" in her list of key concepts and actions necessary for the successful implementation of TQM (Table 5).

Table 5
Key TQM Concepts

-
1. Long-term perspective. TQM cannot be implemented overnight, results will take awhile to appear.
 2. Upper management commitment. Without upper management commitment and participation, TQM initiatives are destined for failure.
 3. Employ a system approach. TQM transcends the organization.
 4. Training and tools. Everyone in the organization requires training, retraining, and the opportunity to acquire and develop the tools necessary to do their jobs.

Table 5 (Continued)

5. Participation. All individuals in an organization need to participate in quality improvement.
6. New measurement and reporting systems. Information systems that are predominately financial in nature are inadequate to support TQM initiatives.
7. Cross-organizational communication. Establish free and open, non-traditional lines of communication.
8. Leadership. TQM implementation requires vision and commitment.

(Pfau, 1989:18)

TQM in the DoD

The first DoD wide announcement of the TQM policy was the Department of Defense Posture on Quality letter, issued by the then Secretary of Defense, Frank Carlucci, on 30 Mar 1988. The DoD TQM plan mirrors similar undertakings by the private sector of the economy. Increased international competition in manufactured goods brought the realization that quality was not a cost of production but a competitive advantage.

DoD plans to use TQM to incorporate continuous improvement into all activities of the military departments and the defense industry (Carlucci, 1988). Continuous improvement consists of a management philosophy and a set of statistical techniques, wherein higher levels of quality are achieved by continually searching for better methods. The goal of the TQM process is to have continuous improvement become the invisible hand guiding the actions of all

employees. Thus the intent is to affect the entire organizational culture so that the TQM process, per se, fades away. What remains are the principles and practices of continuous improvement embodied in the work force. The principal governing regulation defines TQM as:

A philosophy and a set of guiding principles that represent the foundation of a continuously improving organization. It is the application of quantitative methods and human resources to improve the material and services supplied to an organization, all the processes within an organization, and the degree to which the needs of the customer are met, now, and in the future. It integrates fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach focused on continuous improvement. (Department of Defense Directive 5000.51, 1989)

TQM as Change Agent

One of the most prevalent themes in the quality literature is that a company must undergo a cultural change in order to achieve successful and lasting quality improvement. In fact Godfrey credits Rosabeth Moss Kanter for observing that quality management has proved to be the most effective means for achieving a change in culture (Karabatsos, 1989:25). Thus quality philosophies are the means for affecting changes in attitudes, beliefs, and norms of organizations and their members.

Assessment Tool

As a philosophy built on the premise of continuous improvement, TQM implementation should naturally include self-assessment mechanisms. Jennings states that

organizations which build in this capacity become "learning organizations" capable of adapting to a changing world.

TQM Survey as Assessment Tool

If TQM is based on continuous improvement then the TQM process itself should be continuously improved. Therefore the TQM process must be measured and evaluated similar to other processes. The Attitude Survey is a method to accomplish such measurement and evaluation. The remainder of the thesis effort is devoted to analyzing how good a measurement device the survey is and what the results of the survey indicate about the TQM program for the relevant organization.

III. Methodology

Overview

The objective of this chapter is to delineate the research methods used to answer the hypotheses formulated in Chapter I. In particular, it presents the methods used in data collection and analysis.

Population and Sample

The first step in the research process was to identify an appropriate population that was sufficiently exposed to Total Quality Management (TQM) that the members could be surveyed regarding their perceptions of TQM. An Air Force acquisition organization with a two-letter office symbol met this criterion because its personnel had undergone TQM training and were well involved with implementation. For the purpose of this study, this organization will remain anonymous and, henceforth, will be referred to as organization "QX" (quality experiment). The "QX" quality measurement office had recently administered a survey that was deemed suitable for this study because the variables used in their questionnaire were applicable to the scope of this research. Therefore the population consisted of all 681 members of "QX".

Some background information about the population is necessary to understand the sample selection. Of the total

population of 681 people, 585 are assigned to specialized acquisition offices under a matrix organizational structure, and the remaining 96 serve as "QX" staff. The matrix organizational structure means that the people in this subgroup are assigned to two organizations simultaneously. The "home" organization to which they are primarily assigned is usually functionally oriented, but they serve as dedicated members of another organization which is usually project oriented. Also for the population as a whole, 266 of the people are members of the military and 415 are civilians. The breakdown of military and civilian members in these two major subgroups are shown below in Table 6, with the row and column percentages included:

Table 6
Crosstabulation of Office Type With
Military/Civilian Status

	<u>Matrix</u>	<u>Staff</u>	<u>Row Total</u>
Military	240	26	266
Row Pct	.90	.10	.39
Col Pct	.41	.27	
Civilian	345	70	415
Row Pct	.83	.17	.61
Col Pct	.59	.73	
<u>Column</u>	<u>585</u>	<u>96</u>	<u>681</u>
Total	.86	.14	1.00

Because the data was intended for in-house use only, the "QX" quality measurement office considered an 85 percent

plus or minus 5 percent confidence level sufficient for making general inferences. Using this confidence level, they calculated the sample size from the following general formula for computing a minimum sample size with a known finite population:

$$n = \frac{N (Z^2) \times p(1 - p)}{(N-1) (d^2) + [(z^2) \times p(1 - p)]} \quad (1)$$

where

- n = sample size
- N = population size
- p = maximum sample size factor (.5)
- d = desired tolerance (.05)
- z = factor of assurance (1.44) for 85% confidence level

With N= 681, the above formula resulted in a minimum sample size of 160. In actuality, a total of 179 individuals, 84 matrix and 95 staff, were surveyed. This sample size was considered adequate to obtain enough useable responses for the desired confidence/reliability factor. The organization intended to do a stratified random sampling based on grade/rank for the 585 people in the matrix sub-group. Due to calculation errors, however, the sample number within each stratum was underestimated which led to the whole staff sub-group being underestimated, defeating the purpose of stratification by weakening the sample's

representativeness of the population. For the staff, they planned a 100% sample of the entire 96 member sub-group, however, one person declined to participate.

Survey Instrument

The survey instrument used to gather data is contained in Appendix A. The Air Force Military Personnel Center (AFMPC) reviewed and approved the instrument per AF Regulation 30-23, "The Air Force Personnel Survey Program", and assigned survey control number 90-02 with expiration on 30 June 1990. The content was largely derived from similar instruments used at the Air Force Academy to measure "organizational climate". Consequently, the organization did not perform preliminary tests of reliability and internal validity; these issues were considered substantiated by prior research.

The survey instrument comprised 133 questions; however, only 109 of the questions were pertinent for this research. The first 11 questions sought demographic information; the next 90 questions dealt with attitudes about the organizational culture; and the remaining 8 questions focused on attitudes about topics of importance to "QX". Except for the demographic questions, the survey instrument used a seven-point Likert scale to rate (dis)agreement with statements related to certain aspects of organizational culture or other specific topics. Also, a non-response reply was available, in addition to the seven-point Likert

scale answers. The responses allowed, as listed in the survey, were:

- | | |
|-------------------------------|-------------------------------|
| A. Strongly disagree | E. Slightly agree |
| B. Disagree | F. Agree |
| C. Slightly disagree | G. Strongly agree |
| D. Neither agree nor disagree | H. Can't answer/doesn't apply |

Unique features of the survey instrument required special attention prior to data analysis. The following numbered questions were found to be negatively worded relative to the overall measure and were reverse scored before analysis: 13, 21, 28, 37, 42, 46, 47, 57, 59, 73, 75, 80, 86. Another coding anomaly was caused by a typographical error in the alphabetical response range for question number 7, "To which group do you belong?". The response range was from a. to j., omitting e. and f.; instead of a. to h. inclusive. To avoid last minute confusion, the respondents were told to code the letter as typed on the survey. To simplify the discussion of the data analyses, the groups included under individual survey questions were numbered in sequential order.

The survey instrument was designed in part to measure seven demographic variables and 26 criterion variables. The demographic variables are: organizational symbol, organizational tenure, military rank or civilian grade, supervisory status, education level, aeronautical rating, and command affiliation. These variables are self-explanatory; except it must be noted that organizational symbol was requested one letter per question up to a maximum

of five. The criterion variables are composed of one, or a combination of several, of the 90 questions relating to cultural attitudes. The "QX" quality measurement office provided the details on which questions correspond to particular criterion variables, the variables' names, and each variable's operational definition. To ensure the integrity of the survey, the match between questions and variables was not reported in this research. For the sake of clarity, each criterion variable's name and operational definition are shown in Table 7.

Table 7

Names and Operational Definitions of
Survey Instrument Criterion Variables

1. Accountability: Measures the amount of responsibility for quality work that members of the organization are given.
2. Achievement: Measures individual's sense of satisfaction gained from seeing positive results in job performance.
3. Autonomy: Measures individual's opportunity to exercise discretion in making decisions concerning work activities.
4. Career: Measures individual's sense of organizational/supervisory interest in individual's career development.
5. Communications: Measures the definition and freedom of dialogue up, down, and across organizational structure.
6. Concern for individual: Measures the belief that leader care about the welfare of individuals and that they are respected as unique and able.
7. Confidence in management: Measures the belief that leaders make competent decisions based on a good understanding of what is going on in the organization.

Table 7 (Continued)

8. Contribution/Participation: Measures individual's role in setting organizational goals and policy as well as individual's perception that work has a positive impact on organizational mission and is valuable to the USAF.

9. Customer focus: Measures the extent to which customer satisfaction is the end product of the organization.

10. Group cohesiveness: Measures ability to function and cooperate well as a team in accomplishing its mission.

11. Job satisfaction: Measures the extent to which individual feels fulfilled and content with the work he/she does.

12. Mission comprehension: Measures the extent to which the mission of the organization, including roles and relationships, is understood.

13. Motivation: Measures individual's perception of directorate morale, eagerness to achieve, and ability to accomplish.

14. Performance barriers: Measures the adverse impact of additional duties, distractions, and lack of resources on job performance.

15. Personal growth: Measures individual's opportunity for self-fulfillment and enhancement by developing new interests and skills.

16. Readiness for change: Measures responsiveness of higher management to new ideas and technology.

17. Recognition: Measures individual's opportunity to present work and obtain appreciation from department, community, etc.

18. Risk: Measures the extent to which innovation is encouraged by the organization.

19. Satisfaction with supervisors: Measures quality and quantity of support and guidance received in performing work and in achieving personal and career objectives.

20. Survey: Measures perception of survey as a good communication medium and anticipation of potential positive outcomes from survey results.

Table 7 (Continued)

21. Task characteristics: Measures individual's perception of job, including significance, variety, complexity, distinctness, and potential for self-critique.
22. Training: Measures organizational support of education in furtherance of individual's job capability as well as individual's personal interest in further education.
23. Trust in judgment: Measures amount of trust put by supervisory levels in individual's ability to make good decisions.
24. Unit effectiveness: Measures organization's productivity, effective handling of resources, and quality of work.
25. Utilization: Measures amount of challenge job provides to individual as well as extent to which job makes use of individual's abilities, training, and expertise.
26. Work interferences: Measures impact organizational bottlenecks have on work flow.
-

The remaining 24 questions asked of the respondents were not included in this analysis, nor shown with the survey in Appendix A. Nineteen of these questions were a follow-on to a 1988 survey by the contractor who performed the TQM training. The randomness of that original survey was suspect and, according to the current survey, the data was sought "in order to get a 'general' feeling of improvement or decline in the organizational climate...". The last five questions had not been approved by AFMPC and were asked on a voluntary basis for additional general information. These 24 questions were considered ancillary

to the principal measurements being researched by this study, so they were removed from consideration.

Collection of Data

Data for this research was collected by "QX" measurement personnel over a two-week period from 6 - 20 January, 1990. Data was collected by having individuals meet at a prearranged time and place expressly for the purpose of completing the questionnaire. Computer scoring sheets were used. An organizational roster of names was used for the sample selection by assigning a number to each name on the roster; and then selecting participants using a random number table. A letter signed by the organizational commander encouraged voluntary participation. All instrument booklets and coding sheets were anonymously collected to maintain confidentiality.

Despite the difficulties inherent in using data collected by another source, the decision was made to use existing data. In the opinion of TQM measurement personnel and managers, the response rate to an additional survey was anticipated to be low due to the plethora of surveys recently administered to acquisition organization personnel. Though many of these recent surveys dealt with quality, the survey instruments were poorly constructed and the research design was non-existent. The general population of acquisition personnel were negatively predisposed to another quality related survey effort, no matter how well conceived.

Therefore, the "QX" quality measurement office's survey was selected as the most practical and useful source of data.

Analysis of Data

The analysis of data was accomplished in four major sections using the statistical package, SPSSX. First, the survey instrument was analyzed for reliability and an initial profile of the respondents was obtained. Second, the number of survey variables were reduced to simplify and focus the analyses of hypotheses Ho1a-Ho1i and Ho2a-Ho2i. Third, dependent variables directly relating to TQM were identified for analyzing hypotheses Ho3a-Ho3c. Fourth, the the composite and demographic variables from section two were tested as predictors of the dependent variables related to TQM for analyzing hypotheses Ho4a-Ho4c and Ho5a-Ho5c, respectively.

Section One. The reliability of the survey instrument was checked to assess whether the criterion variables were free of measurement error. As originally devised, 90 of the survey questions measured 26 criterion variables. By calculating how well multiple questions measure an intended criterion variable, one can ascertain the reliability that the survey measures what it purports to measure. For this purpose, Cronbach's alpha coefficient was computed to analyze the reliability of the 26 criterion variables. A coefficient value of .65 or above was considered adequately reliable and the variable was accepted. Individual survey

questions that largely detracted from a criterion variable's alpha coefficient were removed to improve the reliability of the overall measure. However, data collected on individual questions were used where appropriate for other analyses.

In addition, univariate analysis was used for description of the data and for checking representativeness of the sample. A frequency distribution was constructed for each demographic variable, in order to describe the data.

Section Two. A procedure of data reduction was performed to aid in analyzing HOLA-HOLI and HO2A-HO2I. The procedure began by grouping the remaining criterion variables from above based on the literature of quality improvement. These groupings were then ascribed a name and reviewed for validity by experts in TQM at the Air Force Institute of Technology (AFIT). The resulting groups comprised a set of nine composite variables measuring key dimensions of an organization's quality culture. The dimensions of the organization's culture, and hence the composite variables, relate to quality improvement. Each composite variable consisted of at least two criterion variables, but no composite variable included more than three criterion variables. Also, no criterion variable was associated with more than one composite variable, in order to keep the analysis straightforward. The composite variables and the underlying criterion variables, with the operational definition, are shown in Table 8.

Table 8

Composite Variables Matched With
Underlying Criterion Variables

1. Management:

Confidence in management: measures the belief that leaders make competent decisions based on a good understanding of what is going on in the organization.

Readiness for change: measures responsiveness of higher management to new ideas and technology.

Satisfaction w/ supervisors: measures quality and quantity of support and guidance received in performing work and in achieving personal and career objectives.

2. Goals:

Customer focus: measures the extent to which customer satisfaction is the end product of the organization.

Unit effectiveness: measures organization's productivity, effective handling of resources, and quality of work.

3. Positive Outlook:

Job satisfaction: measures the extent to which individual feels fulfilled and content with the work he/she does.

Motivate: measures individual's perception of directorate morale, eagerness to achieve, and ability to accomplish.

4. Help Individuals:

Career: measure individual's sense of organizational/supervisory interest in individual's career development.

Concern for individual: measures the belief that leaders care about the welfare of individuals and that they are respected as unique and able.

Personal growth: measures individual's opportunity for self-fulfillment and enhancement by developing new interests and skills.

5. Employee Involvement:

Accountability: measures the amount of responsibility for quality work that members of the organization are given.

Contribution/participation: measures individual's role in setting organizational goals and policy as well as individual's perception that work has a positive impact on organizational mission and is valuable to the USAF.

Group cohesiveness: measures ability to function and cooperate well as a team in accomplishing its mission.

Table 8 (Continued)

6. Trust in Employee:

Autonomy: measures individual's opportunity to exercise discretion in making decisions concerning work activities.
Risk: measures the extent to which innovation is encouraged by the organization.
Trust in judgement: measures amount of trust put by supervisory levels in individual's ability to make good decisions.

7. Organization Communication:

Communications: measures the definition and freedom of dialogue up, down, and across organizational structure.
Mission comprehension: measures the extent to which the mission of the organization, including roles and relationships, is understood.
Survey: measures perception of survey as a good communication medium and anticipation of potential positive outcomes from survey results.

8. Personal Rewards:

Achievement: measures individual's sense of satisfaction gained from seeing positive results in job performance.
Recognition: measures individual's opportunity to present work and obtain appreciation from department, community, etc.

9. Work Enhancement:

Task characteristics: measures individual's perception of job, including significance, variety, complexity, distinctness, and potential for self-critique.
Utilization: measures amount of challenge job provides to individual as well as extent to which job makes use of individual's abilities, training, and expertise.

Next, the nine composite variables were validated using Pearson's product-moment linear correlation procedure and Cronbach's alpha test of measurement reliability. Criterion variables which showed a moderate to strong strength of relationship using Pearson's correlation coefficient (r)

were retained as related components of the composite measure. To further ensure that the grouped criterion variables were measuring the same factor, the intended composite variables were analyzed using Cronbach's alpha procedure. A high alpha coefficient indicates reliability in measuring a single factor. The criterion of a .65 and above alpha coefficient again determined acceptability.

The last major step was to use the appropriate demographic variables to test for statistically significant differences between respondent groups and their responses to the composite variables. Bivariate analysis using Supervision and Grade/Rank as independent variables and the composite measures as dependent variables was used to test H_{01a}-H_{01i} and H_{02a}-H_{02i}, respectively. Because supervision is a dichotomous variable, a t-test was used to test for statistically significant differences among respondents. Because grade/rank is a categorical variable, a one-way ANOVA technique was performed to test for any significant differences among groups.

Section Three. Part three started with constructing a composite measure of the TQM process. Three of the "QX" peculiar survey questions specifically used the term TQM:

104. I understand the concept of Total Quality Management (TQM).
105. I believe the TQM process will make "QX" a better place to work.
106. I have personally seen positive results from Total Quality Management.

The method described in section two above was used to combine these questions into a single measure of TQM, but the correlation coefficient and alpha coefficient were too low to justify a composite variable. Consequently, the three questions were used as separate dependent variables in analyzing Ho3a-Ho3c, Ho4a-Ho4c, and Ho5a-Ho5c. The names and descriptions of the variables are:

TQM1: Understand TQM concept

TQM2: TQM improves work place

TQM3: TQM leads to positive results

Bivariate analyses were used to test Ho3a-Ho3c. The relationship between the above-mentioned dependent variables and the independent variables, Supervision and Rank/Grade, were examined using t-test and Anova techniques. Also, the demographic variables of Organizational Tenure, Education, and Command Affiliation were used as control variables and similarly studied.

Section Four. Hypotheses Ho4a-Ho4c were tested using a multivariate procedure of regression analysis to see if the composite variables serve as predictors for determining the dependent variables pertaining to TQM. This test indicates whether attitudes about the composite measures correlate strongly to attitudes about TQM. Because the predictor variables constitute aspects of an organization's culture, regression should reveal the strength of the relation between the culture and TQM.

A second regression analysis was performed to examine the relationship between the independent/control demographic variables and the dependent variables regarding TQM. Again, the intent was to isolate factors which may have predictive strength relative to attitudes about TQM, thereby testing Ho5a-Ho5c.

IV. Analysis Of Data

Overview

The purpose of this study was to determine if groups within an organization actively involved with TQM had common attitudes about the organizational culture relative to quality. Because TQM necessitates such far-reaching changes in an organization that its full implementation constitutes a cultural transformation, the convergence of positive attitudes about quality-related cultural factors among diverse organizational groups indicates successful implementation of the TQM process. To this end, data collected with the survey instrument in Appendix A were analyzed to address the hypotheses stated in Chapter 1.

Survey Response Rate

The survey was administered to 179 individuals from the "QX" organization, 95 internal staff and 84 matrix assignees. Nine of the coding forms were deemed unusable due to errors or missing entries. Thus 170 individuals, or 95 percent of the initial respondents, were included in the data analysis. The 170 individuals consisted of 92 staff and 78 matrix personnel. This sample size exceeded the minimum number of 160 required for a confidence interval of 85 percent plus or minus 5 percent. The confidence interval realized was 86.64 percent plus or minus five percent.

Sample Compared to Population

The sample data were analyzed along the dimensions of organization type, staff or matrix, and membership status, military or civilian, similar to the analysis for the population in Chapter 3 (see Table 6). The results are shown in Table 9.

Table 9

Crosstabulation of Office Type With
Military/Civilian Status Per Sample Responses

	<u>Matrix</u>	<u>Staff</u>	<u>Row Total</u>
Military	43	27*	70
Row Pct	.61	.39	.41
Col Pct	.55	.30	
Civilian	35	64	99
Row Pct	.35	.65	.59
Col Pct	.45	.70	
Column	78	91**	169
Total	.46	.54	1.00

* One more respondent than population.

** One missing value.

As anticipated in the discussion of calculating sample size, the sample is over-representative of staff versus matrix personnel. The staff sub-group is 14 percent of the total "QX" population, but 54 percent of the total sample. The corresponding change for the matrix sub-group is 86 percent of the population to 46 percent of the sample. A consequence of the sample bias toward the staff sub-group is that the percentage of military and civilians in that sub-

group are also over-represented by the sample. Of the total population, 10 percent of the military and 17 percent of the civilians belong to the staff, but for the sample 39 percent of the military and 65 percent of the civilians belong to the staff. Though the relative percentages of military and civilian sub-groups changed only 2 percent from the population to the sample, the composition of the sub-groups reflected the staff bias.

One consequence of the under-representation of the matrix sub-group in the sample is to limit the validity of generalizing results. In reaching conclusions from the data analyses, one must remember that the sample did not reflect the true "QX" population and individual measures may be partially corrupt. Another consequence of the sampling error was to invalidate any direct comparison of the two organizational types, staff and matrix. Because matrix personnel were under-represented by about half, there is little reliability in assuming the sample reflects the sub-population of all matrix personnel. For this reason, analysis of the two groups was limited to descriptive frequency data, in order to provide the reader a clear understanding of the composition of the sample.

Reliability Test Results

Cronbach's alpha test of measurement reliability was performed on the 23 criterion variables which were computed by two or more survey questions. Three additional criterion

variables were not tested because they were based on a single question. Two of the 23 criterion variables had alpha coefficients below .65, so they were excluded from consideration throughout the remainder of the study. The Cronbach alpha coefficient values for each criterion variable are shown in Table 10.

Table 10
Cronbach's Alpha Coefficient of Reliability
for Criterion Variables

Variable	Cronbach's Alpha
Accountability	.77
Achievement	.82
Autonomy	.79
Career	.65
Communications	.81
Concern for individual	.84
Confidence in management	.74
Contribution/participation	.68
Customer focus	.71
Group cohesiveness	.72
Job satisfaction	.84
Mission comprehension	.80
Motivation	.70
Performance barriers	.33*
Personal growth	.76
Readiness for change	--
Recognition	.72
Risk	.85
Satisfaction w/ supervisor	.87
Survey	.79
Task characteristics	.76
Training	.42*
Trust in judgement	--
Unit effectiveness	.84
Utilization	.83
Work interferences	--

-- Denotes single question variable, test not applicable.

* Denotes values below .65 acceptance threshold.

Survey Demographics

Univariate analysis was performed to provide a description of the sample. Frequency distributions were built to reveal characteristics of the sample and histograms were used to illustrate the distributions. No analyses of the office symbol variables were performed in compliance with the request for anonymity by the "QX" organization.

Except for the variable, Aeronautical Rating, separate frequency distributions and histograms were analyzed for the total sample, the sample sub-group of staff personnel, and the sample sub-group of matrix personnel. The intent was to clarify how much both major sub-groups contributed to each individual category within a demographic variable. For example, within the variable Organizational Tenure 34 people responded with category 1, "less than 1 year", as shown in Figure 1. Figures 2 and 3 reveal that exactly half of the 34 respondents were from each sub-group. For the variable, Aeronautical Rating, the too few responses in the categories of interest did not warrant separate distributions.

Time in Organization. Figure 1 shows the distribution of responses for the total sample based on how long they have been assigned to their current organization. Close to half of the sample, 47.1 percent, have under two years time in their current organization, indicating the sample was composed of relatively new organizational members.

ORGANIZATIONAL TENURE	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
Less than 1 year	1	34	20.0	20.0	20.0
1-2 years	2	46	27.1	27.1	47.1
2-3 years	3	30	17.6	17.6	64.7
3-4 years	4	31	18.2	18.2	82.9
More than 4 years	5	29	17.1	17.1	100.0
	TOTAL	170	100.0	100.0	

HISTOGRAM FREQUENCY

COUNT	VALUE	ONE SYMBOL EQUALS APPROXIMATELY 1.00 OCCURRENCES
34	1.00	*****
46	2.00	*****
30	3.00	*****
31	4.00	*****
29	5.00	*****
	I.....I.....I.....I.....I.....I	
	0 10 20 30 40 50	

Figure 1. Frequency Distribution: Length of Time Assigned to Current Organization for Total Sample

Comparison of Figures 2 and 3 reveals that the staff sub-group is more evenly distributed among all categories of responses than the matrix sub-group. The matrix sub-group, on the other hand, reflects the total sample distribution with the large modal value at category 2. So, compared to the staff sub-group, the matrix sub-group had slightly less experience in their current organizations. With the sample bias favoring the staff, the attitudes of newcomers may be overshadowed. The most noticeable difference is the 21 staff people with 3-4 years organizational experience compared to the 10 matrix people in the same category.

ORGANIZATIONAL TENURE	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
Less than 1 year	1	17	18.5	18.5	18.5
1-2 years	2	21	22.8	22.8	41.3
2-3 years	3	17	18.5	18.5	59.8
3-4 years	4	21	22.8	22.8	82.6
More than 4 years	5	16	17.4	17.4	100.0
		-----	-----	-----	
	TOTAL	92	100.0	100.0	

HISTOGRAM FREQUENCY

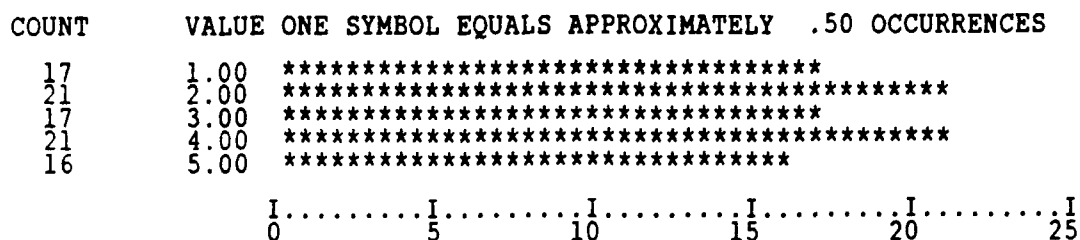


Figure 2. Frequency Distribution: Length of Time Assigned to Current Organization for Staff Sub-Group

ORGANIZATIONAL TENURE	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
Less than 1 year	1	17	21.8	21.8	21.8
1-2 years	2	25	32.1	32.1	53.8
2-3 years	3	13	16.7	16.7	70.5
3-4 years	4	10	12.8	12.8	83.3
More than 4 years	5	13	16.7	16.7	100.0
		-----	-----	-----	
	TOTAL	78	100.0	100.0	

HISTOGRAM FREQUENCY

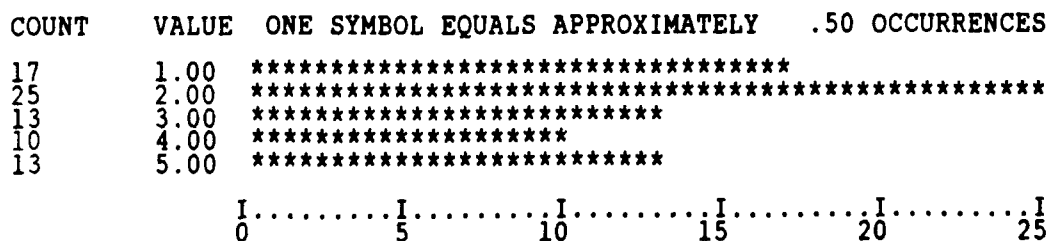


Figure 3. Frequency Distribution: Length of Time Assigned to Current Organization for Matrix Sub-Group

Military Rank/Civilian Grade. Respondents were asked to indicate their military rank or civilian pay grade. Responses are summarized in Figure 4. Descriptive information about individual segments and broader groups are evident. Civilians outnumber military 99 to 70, or 58.6 percent to 41.4 percent. The senior civilian segment is the largest at 18.2 percent, probably because it includes the broadest range of criteria. Civilian GS-12s are highly represented with 26 responses, for 15.3 percent of the total. Lower ranking military officers eclipse senior officers, but officers in total far outnumber enlisted persons.

RANK/GRADE	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
O-1, O-2, O-3	1	26	15.3	15.4	15.4
O-4, O-5, O-6	2	19	11.2	11.2	26.6
E-1 TO E-6	3	12	7.1	7.1	33.7
E-7, E-8, E-9	4	13	7.6	7.7	41.4
GS 1-7 ADMIN	5	26	15.3	15.4	56.8
GS 5 TO GS 11	6	16	9.4	9.5	66.3
GS 12	7	26	15.3	15.4	81.7
GS/GM 13 TO 15, SES	8	31	18.2	18.3	100.0
	0	1	.6	MISSING	
	TOTAL	170	100.0	100.0	

HISTOGRAM FREQUENCY

COUNT VALUE ONE SYMBOL EQUALS APPROXIMATELY .80 OCCURRENCES

26	1.00	*****
19	2.00	*****
12	3.00	*****
13	4.00	*****
26	5.00	*****
16	6.00	*****
26	7.00	*****
31	8.00	*****

I.....I.....I.....I.....I.....I
0 8 16 24 32 40

Figure 4. Frequency Distribution: Military Rank/Civilian Grade for Total Sample

Figures 5 and 6 show that the staff organization contributes more civilians and fewer military than the matrix organization. In particular, senior civilians are more common from the staff sub-group and enlisted military are more common from the matrix sub-group. Military officers and junior-grade civilians are approximately equal between the sub-groups.

RANK/GRADE	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
O-1, O-2, O-3	1	13	14.1	14.3	14.3
O-4, O-5, O-6	2	7	7.6	7.7	22.0
E-1 TO E-6	3	3	3.3	3.3	25.3
E-7, E-8, E-9	4	4	4.3	4.4	29.7
GS 1-7 ADMIN	5	15	16.3	16.5	46.2
GS 5 TO GS 11	6	8	8.7	8.8	54.9
GS 12	7	17	18.5	18.7	73.6
GS/GM 13 TO 15, SES	8	24	26.1	26.4	100.0
	0	1	1.1	MISSING	
		-----	-----	-----	
	TOTAL	92	100.0	100.0	

HISTOGRAM FREQUENCY

COUNT	VALUE	ONE SYMBOL EQUALS APPROXIMATELY .50 OCCURRENCES
13	1.00	*****
7	2.00	*****
3	3.00	*****
4	4.00	*****
15	5.00	*****
8	6.00	*****
17	7.00	*****
24	8.00	*****
		I.....I.....I.....I.....I.....I
		0 5 10 15 20 25

Figure 5. Frequency Distribution: Military Rank/Civilian Grade for Staff Sub-Group

RANK/GRADE	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
O-1, O-2, O-3	1	13	16.7	16.7	16.7
O-4, O-5, O-6	2	12	15.4	15.4	32.1
E-1 TO E-6	3	9	11.5	11.5	43.6
E-7, E-8, E-9	4	9	11.5	11.5	55.1
GS 1-7 ADMIN	5	11	14.1	14.1	69.2
GS 5 TO GS 11	6	8	10.3	10.3	79.5
GS 12	7	9	11.5	11.5	91.0
GS/GM 13 TO 15, SES	8	7	9.0	9.0	100.0
		-----	-----	-----	
	TOTAL	78	100.0	100.0	

HISTOGRAM FREQUENCY

COUNT	VALUE	ONE SYMBOL EQUALS APPROXIMATELY .40 OCCURRENCES
13	1.00	*****
12	2.00	*****
9	3.00	*****
9	4.00	*****
11	5.00	*****
8	6.00	*****
9	7.00	*****
7	8.00	*****
	I.....I.....I.....I.....I.....I	
	0 4 8 12 16 20	

Figure 6. Frequency Distribution: Military Rank/Civilian Grade for Matrix Sub-Group

Supervisory Status. The number of supervisors sampled is shown in Figure 7. Of 170 respondents, 38 confirmed that they provide daily direction to other employees. Most people, 132, do not perform supervision as a daily function. Figures 8 and 9 show that of the 38 supervisors, 16 are members of the staff and 22 are members of matrix organizations.

SUPERVISORY STATUS	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
SUPERVISOR	1	38	22.4	22.4	22.4
NON-SUPERVISOR	2	132	77.6	77.6	100.0
		-----	-----	-----	
	TOTAL	170	100.0	100.0	

HISTOGRAM FREQUENCY

COUNT VALUE ONE SYMBOL EQUALS APPROXIMATELY 4.00 OCCURRENCES

38 1.00 *****

132 2.00 *****

I.....I.....I.....I.....I.....I

0 40 80 120 160 200

Figure 7. Frequency Distribution: Supervisory Status for Total Sample

SUPERVISORY STATUS	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
SUPERVISOR	1	16	17.4	17.4	17.4
NON-SUPERVISOR	2	76	82.6	82.6	100.0
		-----	-----	-----	
	TOTAL	92	100.0	100.0	

HISTOGRAM FREQUENCY

COUNT VALUE ONE SYMBOL EQUALS APPROXIMATELY 2.00 OCCURRENCES

16 1.00 *****

76 2.00 *****

I.....I.....I.....I.....I.....I

0 20 40 60 80 100

Figure 8. Frequency Distribution: Supervisory Status
for Staff Sub-Group

SUPERVISORY STATUS	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
SUPERVISOR	1	22	28.2	28.2	28.2
NON-SUPERVISOR	2	56	71.8	71.8	100.0
		-----	-----	-----	
	TOTAL	78	100.0	100.0	

HISTOGRAM FREQUENCY

COUNT	VALUE	ONE SYMBOL EQUALS APPROXIMATELY 1.20 OCCURRENCES
22	1.00	*****
56	2.00	*****
		I.....I.....I.....I.....I.....I.....I
		0 12 24 36 48 60

Figure 9. Frequency Distribution: Supervisory Status
for Matrix Sub-Group

Highest Level of Education. Respondents were asked to report the highest level of formal education completed. The median and mean values were calculated to be a four year degree, as evidenced by 58.2 percent of responses at or above value 4. The largest segment, 34.7 percent, defined the modal category to be having had some college course work. Over 25% of the respondents answered that they have an advanced degree of some type.

The most striking contrast when comparing the frequency distributions for the staff and matrix organizations is in the number of people with advanced degrees. While both sub-groups are nearly identical for some college and a four year degree, the staff sub-group has twice as many people with

Masters' degrees than the matrix organization, 29 to 12. In addition, the only two responses of having Doctoral degrees were from the staff and no one from the staff reported having less than a high school education. The frequency distribution for the total sample is shown in Figure 10. The similarities and differences between staff and matrix sub-groups are evident in the frequency distributions shown in Figures 11 and 12.

HIGHEST LEVEL OF EDUCATION	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
LESS THAN HIGH SCHOOL	1	1	.6	.6	.6
HIGH SCHOOL	2	11	6.5	6.5	7.1
SOME COLLEGE	3	59	34.7	34.7	41.8
BACHELORS DEGREE	4	35	20.6	20.6	62.4
SOME GRADUATE WORK	5	21	12.4	12.4	74.7
MASTERS DEGREE OR EQUIVALENT	6	41	24.1	24.1	98.8
DOCTORAL OR EQUIVALENT	8	2	1.2	1.2	100.0
		-----	-----	-----	
	TOTAL	170	100.0	100.0	

HISTOGRAM FREQUENCY

COUNT	VALUE	ONE SYMBOL EQUALS APPROXIMATELY 1.20 OCCURRENCES
1	1.00	*
11	2.00	*****
59	3.00	*****
35	4.00	*****
21	5.00	*****
41	6.00	*****
2	8.00	**
	I.....I.....I.....I.....I.....I	
	0 12 24 36 48 60	

Figure 10. Frequency Distribution: Highest Level of Education for Total Sample

HIGHEST LEVEL OF EDUCATION	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
HIGH SCHOOL	2	7	7.6	7.6	7.6
SOME COLLEGE	3	29	31.5	31.5	39.1
BACHELORS DEGREE	4	18	19.6	19.6	58.7
SOME GRADUATE WORK	5	7	7.6	7.6	66.3
MASTERS DEGREE OR EQUIVALENT	6	29	31.5	31.5	97.8
DOCTORAL DEGREE	8	2	2.2	2.2	100.0
TOTAL		92	100.0	100.0	

HISTOGRAM FREQUENCY

COUNT	VALUE	ONE SYMBOL EQUALS APPROXIMATELY .60 OCCURRENCES
7	2.00	*****
29	3.00	*****
18	4.00	*****
7	5.00	*****
29	6.00	*****
2	8.00	***
		I.....I.....I.....I.....I.....I
		0.....6.....12.....18.....24.....30

Figure 11. Frequency Distribution: Highest Level of Education for Staff Sub-Group

HIGHEST LEVEL OF EDUCATION	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
LESS THAN HIGH SCHOOL	1	1	1.3	1.3	1.3
HIGH SCHOOL	2	4	5.1	5.1	6.4
SOME COLLEGE	3	30	38.5	38.5	44.9
BACHELORS DEGREE	4	17	21.8	21.8	66.7
SOME GRADUATE WORK	5	14	17.9	17.9	84.6
MASTERS DEGREE OR EQUIVALENT	6	12	15.4	15.4	100.0
TOTAL		78	100.0	100.0	

HISTOGRAM FREQUENCY

COUNT	VALUE	ONE SYMBOL EQUALS APPROXIMATELY .60 OCCURRENCES
1	1.00	**
4	2.00	*****
30	3.00	*****
17	4.00	*****
14	5.00	*****
12	6.00	*****
		I.....I.....I.....I.....I.....I
		0.....6.....12.....18.....24.....30

Figure 12. Frequency Distribution: Highest Level of Education for Matrix Sub-Group

Aeronautical Rating. Participants were asked to report if they were rated as pilots or navigators. Figure 13 shows

the frequency distribution of responses. In the sample, there were only one pilot and three navigators. The pilot and one navigator belong to the matrix sub-group while the other two navigators belong to the staff sub-group. Separate frequency distributions for the staff and matrix sub-groups were deemed unnecessary and were omitted. Due to the very low sample of interest and the overall ambiguity in response categories, this demographic variable was deleted from any subsequent analyses.

AERONAUTICAL RATING	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
NOT RATED	1	63	37.1	37.1	37.1
PILOT	2	1	.6	.6	37.6
NAVIGATOR	3	3	1.8	1.8	39.4
OTHER	4	2	1.2	1.2	40.6
CIVILIAN	5	66	38.8	38.8	79.4
CAN'T ANSWER/DOESN'T APPLY	6	35	20.6	20.6	100.0
	TOTAL	170	100.0	100.0	

HISTOGRAM FREQUENCY

COUNT	VALUE	ONE SYMBOL EQUALS APPROXIMATELY 1.50 OCCURRENCES
63	1.00	*****
1	2.00	*
3	3.00	**
2	4.00	*
66	5.00	*****
35	6.00	*****
	I.....I.....I.....I.....I.....I	
	0 15 30 45 60 75	

Figure 13. Frequency Distribution: Aeronautical Rating for Total Sample

Command Assignment. Respondents were asked to report whether they worked for Air Force Systems Command (AFSC) or Air Force Logistics Command (AFLC). A majority of 104 (61.2%) are assigned to AFSC and the remaining 65 (38.2%) are assigned to AFLC. One individual did not respond. Figure 14 shows the frequency distribution of responses.

COMMAND AFFILIATION	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
AFSC	1	104	61.2	61.5	61.5
AFLC	2	65	38.2	38.5	100.0
	0	1	.6	MISSING	
TOTAL		170	100.0	100.0	

HISTOGRAM FREQUENCY

COUNT	VALUE	ONE SYMBOL EQUALS APPROXIMATELY 4.00 OCCURRENCES
104	1.00	*****
65	2.00	*****
I.....I.....I.....I.....I.....I		
	0	40 80 120 160 200

Figure 14. Frequency Distribution: Command Assignment for Total Sample

When the sample is partitioned into the categories of staff or matrix assignment, Command affiliation is an influential characteristic. The staff is predominately from AFSC, 74 to 18, but the majority of matrix people are with AFLC, 47 to 30. Figures 15 and 16 below show the distributions for the respective sub-groups.

COMMAND AFFILIATION	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
AFSC	1	74	80.4	80.4	80.4
AFLC	2	18	19.6	19.6	100.0
		-----	-----	-----	
	TOTAL	92	100.0	100.0	

HISTOGRAM FREQUENCY

COUNT VALUE ONE SYMBOL EQUALS APPROXIMATELY 1.50 OCCURRENCES

74 1.00 *****
18 2.00 *****

I.....I.....I.....I.....I.....I
0 15 30 45 60 75

Figure 15. Frequency Distribution: Command Assignment for Staff Sub-Group

COMMAND AFFILIATION	VALUE	FREQUENCY	PERCENT	VALID PERCENT	CUM PERCENT
AFSC	1	30	38.5	39.0	39.0
AFLC	2	47	60.3	61.0	100.0
	0	1	1.3	MISSING	
		-----	-----	-----	
	TOTAL	78	100.0	100.0	

HISTOGRAM FREQUENCY

COUNT VALUE ONE SYMBOL EQUALS APPROXIMATELY 1.00 OCCURRENCE

30 1.00 *****
47 2.00 *****

I.....I.....I.....I.....I.....I
0 10 20 30 40 50

Figure 16. Frequency Distribution: Command Assignment for Matrix Sub-Group

Data Reduction

The 21 criterion variables which proved reliable (see above, Table 10), and the three criterion variables which could not be tested, were grouped together to form 9 composite variables. The composite variables were meant to better quantify cultural factors related to TQM and to simplify analyses. The nine groupings of criterion variables were tested using Pearson's product-moment correlation coefficient and Cronbach's alpha coefficient.

Pearson's Product-Moment Test. The Pearson's product-moment test calculates a linear correlation coefficient between two variables which indicates their strength of association. The coefficient can range from + 1.0 (perfect positive linear relationship) to - 1.0 (perfect negative linear relationship) and includes the value 0 (no relationship) as the midpoint (Kachigan, 1986:204). Kidder presented the following guidelines for interpretation of the relationship, either positive or negative (Kidder, 1981:329):

<u>r</u>	<u>Strength of Relationship</u>
> .70	Very strong
.50 - .69	Strong
.30 - .49	Moderate
.15 - .29	Weak
< .15	Not much

The Pearson's product-moment linear correlation test was performed on each set of criterion variables which had been selected as "defining" a composite variable. Within each composite variable set of criterion variables, the relationship between all possible pairs of criterion variables was tested. Those criterion variables which had a Pearson's correlation coefficient (r) greater than or equal to .30, moderate or better strength of relationship, were accepted. Of the 24 criterion variables tested, only the variable Work Interference failed to meet the acceptance criterion. This variable was a single question measure which could not be tested earlier for reliability. Based on the results of the Pearson's test, the variable Work Interference was eliminated, but the validity of the nine composite variables was supported. The results are shown in Table 11.

Table 11
Correlation Coefficients for Criterion Variables
(Grouped By Composite Variable)

Variable Name	Pearson's r	Variable Name
<u>MANAGEMENT:</u>		
Confidence in Management	.7017	Readiness for Change
Confidence in Management	.6589	Satisfaction with Supervisors
Readiness for Change	.4904	Satisfaction with Supervisors
<u>GOALS:</u>		
Customer Focus	.6131	Unit Effectiveness
<u>POSITIVE OUTLOOK:</u>		
Job Satisfaction	.5177	Motivation

Table 11 (Continued)

Variable Name	Pearson's r	Variable Name
<u>HELP INDIVIDUALS:</u>		
Career	.6607	Concern for Individual
Career	.6159	Personal Growth
Concern for Individual	.6669	Personal Growth
<u>EMPLOYEE INVOLVEMENT:</u>		
Accountability	.4066	Contribution-Participation
Accountability	.4267	Group Cohesiveness
Contribution-Participation	.4137	Group Cohesiveness
<u>TRUST IN EMPLOYEES:</u>		
Autonomy	.4688	Risk Aversion
Autonomy	.3620	Trust In Judgment
Risk Aversion	.4733	Trust in Judgment
<u>ORGANIZATION COMMUNICATION:</u>		
Communications	.6038	Survey
Communications	.3947	Mission Comprehension
Survey	.3270	Mission Comprehension
<u>PERSONAL REWARDS:</u>		
Achievement	.3434	Recognition
<u>WORK ENHANCEMENT:</u>		
Work Interferences	.1889*	Utilization
Work Interferences	.0823*	Task Characteristics
Task Characteristics	.7047	Utilization
* Correlation coefficient < .30 acceptance level		

Cronbach's Alpha Test. To further support that the nine composite variables are valid measures, they were tested for internal consistency and homogeneity using Cronbach's alpha test. The purpose of this check was to evaluate if each set

of criterion variables, when taken as a collective whole, would prove to be a reliable measure. If so, then the reliable measure is reasoned to be the homogenous entity "composite variable". By performing this test on all nine sets of criterion variables, the alpha coefficients thus derived would substantiate the named composite variables. Again, the acceptance criterion of .65 or greater was predetermined.

The Cronbach's coefficient for all nine composite variables surpassed the acceptance level, thereby corroborating the validity of the data reduction procedure and the validity of each composite variable. The Cronbach's alpha coefficients ranged from .79 to .89, as shown in Table 12.

Table 12
Cronbach's Alpha Coefficient of Reliability
for Composite Variables

Variable	Cronbach's Alpha
Management	.88
Goals	.87
Positive Outlook	.83
Help Individuals	.89
Employee Involvement	.80
Trust	.83
Organization Communication	.87
Personal Rewards	.79
Work Enhancement	.87
Acceptance criterion of alpha coefficient > .65	

Analysis of Hypotheses

Bivariate analysis was used to test all the null hypotheses associated with Ho1, Ho2, and Ho3 and multivariate analysis was used to test all the null hypotheses associated with Ho4 and Ho5. The bivariate analysis consisted of t-tests when the independent or control variables were dichotomous, and one-way ANOVAs when the independent or control variables had several categories. The multivariate analysis consisted of multiple regression.

The tests of Ho1a-Ho1i used the demographic variable, Supervision, as the independent variable and the nine composite variables as dependent variables. Similarly, the tests of Ho2a-Ho2i used Rank/Grade as the independent variables and the composite variables as dependent variables. Three TQM related measures were used as dependent variables to test Ho3a-Ho3c, Ho4a-Ho4c, and Ho5a-Ho5c. The demographic variables, Supervision, Rank/Grade, Organizational Tenure, Education, and Command Affiliation were the independent variables for Ho3a-Ho3c. These same demographic variables were used as independent variables in a regression analysis to test Ho5a-Ho5c, but the composite variables were used as independent variables to test Ho4a-Ho4c, in a separate regression. Throughout all analyses a statistical significance level of .05 was used to evaluate the test parameters.

Null Hypotheses H₀-H₀i. The individual hypotheses were derived from the basic hypothesis H₀: there will be no statistically significant difference between supervisory and non-supervisory organizational members with regard to their attitudes about the organization's quality culture.

T-test. The sample was divided into two groups, supervisors and non-supervisors, and their responses to each of the nine composite variables were calculated into means. The means were then tested for statistically significant differences using a t-test procedure. Table 13 lists the mean and standard deviation for each groups' response to each composite variable and the associated t-value. T-values marked with an asterisk indicate statistically significant differences in the means of the groups.

Table 13
Comparison of Supervisors and Non-Supervisors
for Composite Variables

Composite Variable	<u>Supervisors</u>	<u>Non-Supervisors</u>	t-value
	Mean/S.D.	Mean/S.D.	
Management	4.90/1.33	4.57/1.44	.23
Goals	5.22/1.09	4.85/1.16	.10
Positive Outlook	4.89/1.29	4.34/1.41	.04*
Help Individuals	4.36/1.43	4.02/1.41	.21
Employee Involvement	5.21/.90	4.90/.96	.10
Trust	5.04/1.06	4.71/1.15	.14
Organization Comm.	4.72/1.01	4.35/1.08	.10
Personal Rewards	5.05/1.24	4.68/1.05	.08
Work Enhancement	5.58/.80	4.90/1.07	.001*

* Statistically significant difference at $p < .05$ level.

Supervisors and non-supervisors were shown by the t-test to differ significantly in their responses on two measures, Positive Outlook and Work Enhancement. In both cases the supervisors' mean score was higher than the non-supervisors', indicating stronger agreement with the measure by supervisors. Positive Outlook is a composite of the criterion variables, Job Satisfaction and Motivation. Work Enhancement is a composite of criterion variables, Task Characteristics and Utilization.

Though the differences were not significant on the other seven composite variables, it is interesting to note that the mean of the supervisors was always higher than that of the non-supervisors. For the most part, the standard deviations were smaller for the supervisors too. This is a general indication that supervisor's are more favorably disposed to the composite measures, and more consistently so.

Summary of Analyses for Hola-Holi. The t-test analysis showed statistically significant differences between supervisory and non-supervisory organizational members with regard to their attitudes about two measures of the organization's quality culture, Positive Outlook and Work Enhancement. The supervisors agreed more strongly than the non-supervisors that the two measures were positively occurring in their organizations. Based on this analysis of the data, the null hypotheses Holc and Holi were rejected.

The seven null hypotheses H_{0a}-H_{0b} and H_{0d}-H_{0h} were evaluated as "fail to reject".

Null Hypotheses H_{02a}-H_{02i}. The individual hypotheses were derived from the basic hypothesis H₀₂: there will be no statistically significant difference among organizational members, sorted by military rank or civilian grade, with regard to their attitudes about the organization's quality culture.

One-way Analysis of Variance. A one-way ANOVA was calculated to determine any significant differences in attitudes about the organization's quality culture by military ranks and civilian grades (Rank/Grade). As part of the ANOVA analysis a multiple range test (Tukey B) was conducted to determine which, if any, of the eight categories of rank and grade differed. The results of the tests are shown in Table 14 below, but a description of the table is first in order.

To assist the reader in understanding Table 14, and similar tables which follow, a brief explanation is provided herewith. The mean and standard deviation (S.D.) for all groups on each composite variable are shown under the variable name. In addition, the mean and standard deviation are shown by group for each composite variable. Also, the group means have been rank-ordered from low to high, 1 to 8, within each composite variable division. This allows a general comparison of the relative position of each group.

Table 14

Comparative Analysis of Mean and Standard Deviation Scores
of Composite Variables (By Rank/Grade Groups)

VARIABLE		GROUP							
Mean		1	2	3	4	5	6	7	8
(S.D.)									
<u>Management *</u>									
4.64	4.54	4.94	4.64	4.85	5.14	5.42	3.92	4.2	
(1.42)	(1.52)	(1.30)	(1.21)	(1.27)	(1.15)	(.98)	(1.42)	(1.66)	
Ranking	3	6	4	5	7 _b	8 _b	1 _a	2	
<u>Goals</u>									
4.93	4.70	4.93	4.82	4.54	5.29	5.38	4.69	5.12	
(1.15)	(1.30)	(1.47)	(1.07)	(1.20)	(.89)	(.74)	(.99)	(1.21)	
Ranking	3	5	4	1	7	8	2	6	
<u>Positive Outlook</u>									
4.46	3.98	4.44	4.60	4.22	4.85	4.80	4.35	4.55	
(1.40)	(1.45)	(1.34)	(1.39)	(1.52)	(1.28)	(1.21)	(1.49)	(1.44)	
Ranking	1	4	6	2	8	7	3	5	
<u>Help Individuals</u>									
4.08	3.94	4.54	4.57	3.79	4.09	4.61	3.40	4.10	
(1.41)	(1.35)	(1.38)	(1.09)	(1.33)	(1.57)	(1.38)	(1.33)	(1.46)	
Ranking	3	6	7	2	4	8	1	5	
<u>Employee Involvement</u>									
4.97	4.95	5.20	5.00	4.47	5.15	5.28	4.66	5.00	
(.95)	(.89)	(.97)	(.91)	(.96)	(.80)	(.90)	(1.08)	(1.02)	
Ranking	3	4.5	6	1	7	8	2	4.5	
Group 1: O1 - O3 Group 4: E7 - E9 Group 7: GS12 Group 2: O4 - O6 Group 5: GS 1-7 ADMIN Group 8: GS/GM 13 to 15, SES Group 3: E1 - E6 Group 6: GS5 - GS11									

* Composite variable with groups significantly different
 a,b..z Groups which differ at $p < .05$ significance level

Table 14 (Continued)

Comparative Analysis of Mean and Standard Deviation Scores
of Composite Variables (By Rank/Grade Groups)

VARIABLE		GROUP							
Mean		1	2	3	4	5	6	7	8
(S.D.)									
<u>Trust In Employee</u>									
4.79	4.29	5.20	4.85	4.87	5.12	4.85	4.22	5.07	
(1.14)	(1.23)	(1.26)	(.70)	(.65)	(1.18)	(.77)	(1.16)	(1.17)	
Ranking	2	8	3.5	5	7	3.5	1	6	
<u>Organization Communication</u>									
4.44	4.23	4.51	4.22	4.12	4.74	4.61	4.11	4.78	
(1.07)	(1.09)	(1.20)	(.96)	(1.19)	(1.13)	(.75)	(1.04)	(1.02)	
Ranking	4	5	3	2	7	6	1	8	
<u>Personal Rewards</u>									
4.76	4.52	5.05	4.89	4.22	4.84	5.32	4.57	4.85	
(1.10)	(.94)	(1.15)	(.92)	(1.18)	(1.06)	(.80)	(1.21)	(1.24)	
Ranking	2	7	6	1	4	8	3	5	
<u>Work Enhancement</u>									
5.06	4.64	5.37	5.00	4.90	5.11	5.21	4.74	5.50	
(1.05)	(1.11)	(.77)	(.96)	(1.08)	(1.04)	(.92)	(1.15)	(1.01)	
Ranking	1	7	4	3	5	6	2	8	
Group 1: O1 - O3 Group 4: E7 - E9 Group 7: GS12 Group 2: O4 - O6 Group 5: GS 1-7 ADMIN Group 8: GS/GM 13 to 15, SES Group 3: E1 - E6 Group 6: GS5 - GS11									

* Composite variable with groups significantly different
a,b..z Groups which differ at $p < .05$ significance level

Composite variables identified with an asterisk have groups which are significantly different. In turn, the groups are identified with a subscripted, lowercase letter (a,b..z) to distinguish exactly which ones are different.

The description for each group is provided in a legend at the bottom of the table for reference.

The ANOVA analysis revealed that three groups were significantly different in their attitudes about the composite variable, Management. Group 7, GS12s, differed from group 5, GS1-7s administrative, and group 6, GS5-11s. As indicated by the order rankings, the GS12s had the lowest mean (3.92) and the GS1-7s administrative and GS5-11s had the highest means (5.14 and 5.42, respectively). In other words, the GS12s have a lower opinion of the measure, Management, than either of the other two groups.

The variable, Management, is comprised of the criterion variables, Confidence in Management, Readiness for Change, and Satisfaction with Supervisors. In the terms of the survey, the GS12's mean reflects that they "slightly disagree" with the measure, while the other two groups "slightly agree". In other words, the GS12s have a much lower opinion of management than do the lower grade civilian employees.

A comparison of the rankings for a group across all variables indicates some general tendencies. Groups 4 and 7 seem to be consistently low, while groups 5 and 6 seem to be consistently high. Which is to say, that senior enlisted and mid-grade civilians share a common negative tendency, while low-grade civilians share a common positive tendency.

Summary of Analyses for Ho2a-Ho2i. The one-way ANOVA showed statistically significant differences between three civilian grades with respect to their attitudes about the quality cultural variable Management. As a result of this analysis of the data, the null hypothesis Ho2a was rejected. The eight null hypotheses Ho2b-Ho2i were evaluated as "fail to reject".

Null Hypotheses Ho3a-Ho3c. The individual hypotheses were derived from the basic hypothesis Ho3: there will be no statistically significant difference between or among groups, in any of the independent or control variables addressed by this study, and the dependent variables pertaining to TQM.

T-tests. For the dichotomous variables, Supervision and Command, t-tests were used to analyze the differences between groups relative to attitudes about TQM. The results of the t-tests are shown in Tables 15 and 16, respectively.

The results of the t-tests show that neither supervisory status, nor Command affiliation, were associated with a statistically significant difference in the responses to the three measures of TQM. None of the t-values in Table 15 and Table 16 were below the .05 level of statistical significance. Consequently, the differences in the means of the groups are not great enough to draw any reliable conclusions from them. One simple observation is that the supervisors' means were higher than non-supervisors.

Table 15
Comparison of Supervisors and Non-Supervisors
for TQM Related Dependent Variables

Dependent Variable	<u>Supervisors</u>	<u>Non-Supervisors</u>	t-value
	Mean/S.D.	Mean/S.D.	
TQM1: Understand TQM Concept	6.03/.82	5.81/1.20	.30
TQM2: TQM Improves Work Place	4.92/1.34	4.88/1.57	.90
TQM3: TQM Leads To Positive Results	4.68/1.70	4.22/1.82	.18

* Indicates a statistically significant difference at the
p < .05 level.

Table 16
Comparison of AFSC/AFLC Command Membership
for TQM Related Dependent Variables

Dependent Variable	<u>AFSC</u>	<u>AFLC</u>	t-value
	Mean/S.D.	Mean/S.D.	
TQM1: Understand TQM Concept	5.80/1.24	5.95/.93	.41
TQM2: TQM Improves Work Place	4.97/1.44	4.74/1.62	.34
TQM3: TQM Leads To Positive Results	4.37/1.83	4.22/1.74	.61

* Indicates a statistically significant difference at the
p < .05 level.

One-way Analysis of Variance. The independent variable, Rank/Grade, and the control variables, Organizational Tenure and Education, were analyzed using an Anova procedure. The results are shown in Tables 17, 18, and 19, respectively. The same format explained earlier was used in constructing the tables.

Table 17
Comparative Analysis of Mean and Standard Deviation Scores
of TQM Variables (By Rank/Grade Groups)

<u>VARIABLE</u>	<u>GROUP</u>							
Mean (S.D.)	1	2	3	4	5	6	7	8
<u>TOM1: Understand TOM Concept</u>								
5.86 (1.13)	6.12 (1.18)	6.00 (.67)	5.67 (.89)	5.17 (1.59)	5.54 (1.42)	6.38 (.62)	5.54 (1.33)	6.17 (.65)
Ranking	6	5	4	1	2.5	8	2.5	7
<u>TOM2: TOM Improves Work Place</u>								
4.88 (1.52)	5.08 (1.32)	5.00 (1.37)	5.17 (1.27)	4.17 (1.59)	4.88 (1.66)	5.71 (1.38)	4.32 (1.73)	4.90 (1.47)
Ranking	6	5	7	1	3	8	2	4
<u>TOM3: TOM Leads to Positive Results</u>								
4.32 (1.80)	4.23 (1.66)	4.95 (1.62)	3.64 (1.63)	3.25 (1.60)	4.76 (1.69)	4.92 (1.83)	3.96 (1.95)	4.39 (1.94)
Ranking	4	8	2	1	6	7	3	5
Group 1: O1 - O3 Group 4: E7 - E9 Group 7: GS12								
Group 2: O4 - O6 Group 5: GS 1-7 ADMIN Group 8: GS/GM 13 to 15, SES								
Group 3: E1 - E6 Group 6: GS5 - GS11								

* Dependent variable with groups significantly different
a,b..z Groups which differ at $p < .05$ significance level

No two groups from Table 17 tested as statistically significantly different. Military rank and civilian grade are not associated with significant differences in attitudes about the measures pertaining to TQM. The means between groups did not differ enough to draw reliable conclusions. However, the senior enlisted (group 4) and middle grade civilians (group 7) ranked consistently low, but the lower grade civilians (group 6) were consistently high.

Table 18

Comparative Analysis of Mean and Standard Deviation Scores
of TQM Variables (By Organizational Tenure Groups)

<u>VARIABLE</u>	<u>GROUP</u>				
Mean (S.D.)	1	2	3	4	5
<u>TQM1: Understand TQM Concept</u>					
5.86 (1.13)	5.76 (1.21)	5.91 (1.00)	5.79 (1.32)	5.87 (1.02)	5.93 (1.19)
Ranking	1	4	2	3	5
<u>TQM2: TQM Improves Work Place</u>					
4.89 (1.52)	5.15 (1.35)	5.09 (1.31)	4.39 (1.66)	4.67 (1.88)	5.00 (1.39)
Ranking	5	4	1	2	3
<u>TQM3: TQM Leads to Positive Results</u>					
4.33 (1.80)	4.38 (1.45)	4.52 (1.66)	3.83 (2.02)	4.23 (2.03)	4.59 (1.82)
Ranking	3	4	1	2	5
Group 1: Less than 1 year			Group 4: 3-4 years		
Group 2: 1-2 years			Group 5: More than 4 years		
Group 3: 2-3 years					

* Dependent variable with groups significantly different
a,b..z Groups which differ at $p < .05$ significance level

As shown in Table 18, Organizational Tenure was not associated with statistically significant differences in attitudes about the TQM measures. The differences in the means between any two groups was not great enough to draw reliable conclusions about the groups. However, it is interesting to note that groups 3 and 4, 2-3 years and 3-4 years respectively, consistently had lower means than the other groups.

Table 19

Comparative Analysis of Mean and Standard Deviation Scores
of TOM Variables (By Education Groups)

<u>VARIABLE</u>	<u>GROUP</u>							
Mean (S.D.)	1	2	3	4	5	6	7	8
<u>TOM1: Understand TOM Concept</u>								
5.86 (1.13)	4.00	5.18 (1.60)	5.72 (1.17)	6.03 (.95)	5.95 (.59)	6.05 (1.22)	--	6.50 (.62)
Ranking	1	2	3	5	4	6	--	7
<u>TOM2: TOM Improves Work Place</u>								
4.89 (1.52)	1.00	4.45 (1.97)	4.80 (1.52)	5.09 (1.50)	4.33 (1.35)	5.30 (1.30)	--	6.00 (.00)
Ranking	1	3	4	5	2	6	--	7
<u>TOM3: TOM Leads to Positive Results</u>								
4.35 (1.80)	7.00	3.82 (1.78)	4.48 (1.78)	4.03 (1.74)	3.48 (1.72)	4.76 (1.77)	--	6.00 (.00)
Ranking	7	2	4	3	1	5	--	6

Group 1: Below High School	Group 4: Bachelors	Group 7: Some Doctoral
Group 2: High School	Group 5: Some Grad.	Group 8: Doctorate
Group 3: Some College	Group 6: Masters	

* Dependent variable with groups significantly different
a,b..z Groups which differ at $p < .05$ significance level

Table 19 displays that Education was not associated with statistically significant differences in attitudes about the TOM measures. The differences in the means between any two groups was not great enough to draw reliable conclusions about the groups. As indicated by the means and standard deviations in the table, there were no respondents in group 7, and limited respondents in groups 1 and 8. Only one

person had less than a high school education and two people had Doctorate degrees.

Summary of Analyses for Ho3a-Ho3c. The t-test analyses demonstrated that there were no statistically significant differences between groups based on supervisory status or Command affiliation. The one-way ANOVA analyses showed that there was no statistically significant differences among groups based on military rank/civilian grade, organizational tenure, or education level. All results failed to meet the criticality criterion of significance at the .05 level. Based on this analysis of the data, the null hypotheses Ho3a-Ho3c were evaluated as "fail to reject".

Null Hypotheses Ho4a-Ho4c. The individual hypotheses were derived from the basic hypothesis Ho4: none of the variables pertaining to the organizational quality culture have predictive value in the multiple prediction of the dependent variables pertaining to TQM.

Multiple Regression. A series of three multiple regressions were performed using the composite variables to test the hypotheses associated with null hypothesis Ho4. First, the nine composite variables were used as independent variables in a stepwise regression of TQM1. Next, the procedure was repeated for TQM2, and then, again for TQM3. Tables 20, 21, and 22 show the results of the regression

analysis for each dependent variable. All the regression tables use the following statistical notation:

B = Partial Regression Coefficient. Represents the amount of change in the dependent variable for each unit increase in the independent variable

SE B = Standard Error Beta. Coefficient of each independent variable expressed in z-score form

Beta = Correlation coefficient between the independent and dependent variable without controlling for other variables

Sig F = Significance level of test for the given variable. Probability of making a type 1 error in rejecting the null hypothesis

Table 20

Multiple Regression Summary: Composite Variable
Prediction for TQM1 (Understand TQM Concept)

<u>Variable</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>Sig F</u>
Organizational Communication	.0236	.0069	.2638	.0008*
(Constant)	4.5419	.3991		.0000*

Equation Form:

$$Y = a + B_1X_1$$

Where

Y = Predicted mean of TQM1

a = Constant

X₁ = Organizational Communication

Equation:

$$Y = 4.5419 + .0236X_1$$

* Statistically significant at 0.05 level

Table 21
Multiple Regression Summary: Composite Variable
Prediction for TQM2 (TQM Improves Work Place)

<u>Variable</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>Sig F</u>
Help Individual	.0434	.0118	.3467	.0003*
Organizational Communication	.0277	.0115	.2266	.0171*
(Constant)	1.8171	.4806		.0002*

Equation Form:

$$Y = a + B_1X_1 + B_2X_2$$

Where

$$\begin{aligned} Y &= \text{Predicted mean of TQM2} \\ a &= \text{Constant} \\ X_1 &= \text{Help Individual} \\ X_2 &= \text{Organizational Communication} \end{aligned}$$

Equation:

$$Y = 1.8171 + .0434X_1 + .0277X_2$$

* Statistically significant at 0.05 level

Table 22
Multiple Regression Summary: Composite Variable
Prediction for TQM3 (TQM Leads to Positive Results)

<u>Variable</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>Sig F</u>
Organizational Communication	.0729	.0103	.4927	.0000*
(Constant)	.3365	.5946		.5722

Equation Form:

$$Y = a + B_1X_1$$

Where

$$\begin{aligned} Y &= \text{Predicted mean of TQM3} \\ a &= \text{Constant} \\ X_1 &= \text{Organizational Communication} \end{aligned}$$

Equation:

$$Y = .3365 + .0729X_1$$

* Statistically significant at 0.05 level

Summary of Analyses for Ho4a-Ho4c. Based on the multiple regression tests, several of the variables have predictive value in regards to attitudes about TQM. Organizational Communication proved the most robust as it

had predictive value for all three measures of TQM. The strongest correlation was between Organizational Communication and TQM3, TQM leads to positive results. For predicting attitudes about TQM improving the work place, the composite variable, Help Individuals, also tested as valuable. This composite measure consisted of the three criterion variables, Career, Concern for Individual, and Personal Growth. In light of these analyses, the null hypotheses Ho4a-Ho4c were rejected.

Null Hypotheses Ho5a-Ho5c. The individual hypotheses were derived from the basic hypothesis Ho5: none of the independent and control variables have predictive value in the multiple prediction of the dependent variables pertaining to TQM.

Multiple Regression. A second series of regressions were used to test null hypotheses Ho5a-Ho5c. This series began by using the demographic variables in place of the composite variables, as possible predictors of the TQM measures. The demographic variables combined the previously defined independent variables, Supervision and Rank/Grade, with the control variables, Organizational Tenure, Education, and Command Affiliation. These five variables were used in a stepwise regression with the variable TQM1 serving as the dependent variable. This procedure was repeated for TQM2 and TQM3, separately. Results of the multiple regression are summarized in Table 23.

Table 23

Multiple Regression Summary: Demographic Variable
Prediction for TQM1 (Understand TQM Concepts)

<u>Variable</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>Sig F</u>
Education	.1593	.0631	.1923	.0125*
(Constant)	5.2224	.2773		.0000*

Equation Form:

$$Y = a + B_1 X_1$$

Where

$$\begin{aligned} Y &= \text{Predicted mean of TQM1} \\ a &= \text{Constant} \\ X_1 &= \text{Education} \end{aligned}$$

Equation:

$$Y = 5.2224 + .1593X_1$$

* Statistically significant at 0.05 level

Summary of Analyses for Ho5a-Ho5c. In the second series of regression analyses only one demographic variable had predictive value, and on only one of the three dependent variables. The control variable, Education, proved to be predictive of TQM1, Understand the Concept of TQM. Therefore, null hypothesis Ho5a was rejected, but null hypotheses Ho5b and Ho5c were evaluated as "fail to reject".

Data Analysis Summary

Through the use of univariate analysis, data about the sample was analyzed for representativeness to the population. Frequency distributions and histograms

illustrated that the sample failed to adequately represent matrix personnel, vice staff personnel. One example of the distortion was the rank and grade mix of military and civilian people in the sample, compared with the population. Consequently, the categorical division of the data may be skewed in the direction of staff personnel by this selection bias. With this potential threat to external validity recognized, the extrapolation of results to the "QX" population was cautiously performed.

Correlation analysis and reliability tests supported the data reduction procedure. Reliability tests indicated which questions and criterion variables from the survey instrument were unreliable, so these were removed. The criterion variables which tested as reliable were formed into nine composite measures of the quality culture. When reduced to the nine composite variables, all but one of the criterion variables showed moderate to strong linear correlations within the composite set. After purging the weak criterion variable, reliability tests of the composite measures showed that they were reliable. In this manner, the 26 initial criterion variables were reduced in number to 23, and these were subsumed into nine composite variables.

Bivariate analysis was used to test H_{01a}-H_{01i}, H_{02a}-H_{02i}, and H_{03a}-H_{03c}. H_{01c}, H_{01i}, and H_{02a} were rejected, but H_{01a}-H_{01b} and H_{01d}-H_{01h}, H_{02b}-H_{02i} were not rejected. Also, H_{03a}-H_{03c} were not rejected. H_{01c} and H_{01i} were

rejected because statistically significant differences existed between the attitudes of supervisors and non-supervisors regarding the quality cultural variables, Positive Outlook and Work Enhancement. Ho2a was rejected because statistically significant differences existed between the attitudes of GS12s and, GS1-7s administrative and GS5-11s, regarding the quality cultural variable, Management. Ho3a-Ho3c were not rejected because statistically significant differences did not exist among the attitudes of the categorical groups within the independent and control variables regarding the TQM variables.

Multivariate analysis was used to test and reject Ho4a-Ho4c. For the dependent variables TQM1 and TQM3, Understand TQM Concept and TQM Leads to Positive Results, multiple regression of the composite variables showed that Organizational Communication had predictive value. Also, Organizational Communication combined with Help Individuals as predictive measures of TQM2, TQM Improves the Work Place.

Multivariate analysis was also used to test and reject Ho5a, but Ho5b and Ho5c were not rejected. In a separate series of regressions using demographic variables, the control variable, Education, was shown to have predictive value for TQM1, Understand TQM Concept. No other independent or control variables were shown to have predictive value.

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Overview

The purpose of this chapter is to summarize the research effort, draw conclusions from the analysis of the data in Chapter 4, and to present recommendations based on insight gained during this study. In particular, the data analysis will be integrated with the hypotheses, and the general issue stated in Chapter 1 will be studied for possible inferences.

Summary

The greater interdependence of national economies and the emergence of a competitive global economy has challenged United States businesses to increase their competitive strength. The loss of market share, indeed entire markets, internationally and domestically has tested U.S. businesses like no event since the Second World War. For the Department of Defense and Defense contractors, the competitive challenge exceeds economic concerns and threatens to undermine our national defense. The loss of key technologies and manufacturing capabilities to foreign sources lessens our self-sufficiency and concomitant freedom of action. Consequently, American businesses and governmental agencies, have been earnestly searching for ways to improve the competitiveness of their enterprises.

The field of Quality has been recognized as one of the fundamental areas where innovative methods can lead to greater productivity and a more competitive posture. In the recent past, quality improvement efforts have taken the form of programmatic techniques, with limited success. The more current approach is Total Quality Management (TQM) which treats quality improvement as a continuous improvement process with the goal of customer satisfaction. From this perspective every aspect of the organization is continually scrutinized for improvement: management goals, individuals, policies, services, and products. Implementation of TQM principles has been a goal of the DoD since March, 1988.

TQM embodies a philosophy of life, applied to organizations. To believe in continuous improvement as a process, implies a certain metaphysical outlook on the world. From the perspective of organizational change, this means that TQM must profoundly shape an organization's culture to be effective. If we accept culture as "the organization's knowledge and beliefs, values, language, and behavioral expectations" (see Ch.1, p.5), then clearly the culture and TQM must be mutually reinforcing. The implied assumptions of continuous improvement need to be active in the culture.

A literature review of the quality philosophies of several experts revealed that they did not fully address the concept of culture, though they all gave it primacy. They

shared the prescription that top management is responsible for transforming the culture to one centered on quality. Also, they agreed that management must be committed, steadfast, and involved in quality to make the cultural transformation happen. In addition, they discussed aspects of the culture, such as communication or incentives. But missing was the definition of the crucial cultural elements and the link to measuring those elements.

The lack of detail in measuring the organizational culture as it relates to quality has led to difficulty in assessing quality improvement efforts. Surely, companies who gain reputations for quality products know they have been successful, but what are the rest to think? Unfortunately, many corporate chiefs think that because they have become quality devotees and performed all the requisite tasks, they have successfully instilled quality in their organizations. However, top management commitment, quality as part of the corporate vision, and process improvement teams do not equate to a transformation of the culture. In such cases, the well-intentioned publicity of the quality program by top management may actually discredit the program further in the eyes of employees who see no fundamental cultural change.

Because TQM implementation is intertwined with changing the organizational culture, it stands to reason that the culture should reflect the relative success of the

implementation effort. In other words, the relative success of TQM implementation should be discernible from how much the organization's culture supports TQM principles. In general, management should look to the organizational culture to appraise the status of their quality improvement efforts.

From the preceding analysis of the literature review the specific problem was derived. The hypotheses were formulated from the specific problem.

Specific Problem. Can the TQM implementation process be assessed by employee attitudes of the organizational culture?

Null Hypotheses. The five basic hypotheses were:

H₀₁ - There will be statistically significant differences between supervisory and non-supervisory organizational members with regard to their attitudes about the organization's quality culture?

H₀₂ - There will be no statistically significant difference among organizational members, sorted by military rank or civilian grade, with regard to their attitudes about the organization's quality culture?

H₀₃ - There will be no statistically significant difference between or among groups, in any of the independent or control variables addressed by this study, and the dependent variables pertaining to TQM.

Ho4 - None of the variables pertaining to the organizational quality culture have predictive value in the multiple prediction of the dependent variables pertaining to TQM.

Ho5 - None of the independent and control variables have predictive value in the multiple prediction of the dependent variables pertaining to TQM.

Research Methodology. The attitude survey in Appendix A was used to appraise the organizational culture. The survey was administered by the pseudonymous "QX" organization from 6-20 January, 1990. The survey was designed to provide in-house data to aid in TQM efforts. Usable responses were received from 170 individuals, exceeding the minimum required for the desired 85 percent plus or minus 5 percent confidence interval. The respondents consisted of 70 military and 99 civilians, with one non-response. Staff people were overrepresented in the sample due to a selection error, so they totalled 92 of the respondents.

Data reduction procedures were performed to reduce the original 26 criterion variables to 9 composite variables. Two criterion variables were removed due to low initial reliability, using Cronbach's alpha test, and the remainder were subsumed under nine composite measures using a subjective empirical method. Each of the nine sets of criterion variables was tested using Pearson's product-

moment linear correlation analysis. This eliminated one criterion variable, but the nine composite measures remained. The nine composite measures all proved reliable using Cronbach's alpha test.

Univariate, bivariate, and multivariate analyses were used to investigate the data. Univariate analysis was used to describe the sample relative to the demographic variables. Bivariate analysis was used to test H₀1a-H₀1i, H₀2a-H₀2i, and H₀3a-H₀3c. These tests consisted of t-tests and ANOVAs depending on the number of categories within the independent or control variable. Tests of H₀4a-H₀4c and H₀5a-H₀5c used multivariate analysis in the form of multiple regression.

The research used variables in a variety of roles, depending on the hypothesis. For H₀1a-H₀1i and H₀2a-H₀2i, demographic variables were split into independent and control variables, and the nine composite variables served as dependent variables. The independent variables were, Supervision and Rank/Grade, and the control variables were, Organizational Tenure, Education, and Command Affiliation. H₀3a-H₀3c used the demographic variables in the same roles as independent and control variables, but introduced three TQM measures as dependent variables. H₀5a-H₀5c used the same variables as H₀3a-H₀3c to perform a regression analysis. However, the test of H₀4a-H₀4c substituted the

nine composite variables for the demographic variables, but retained the TQM measures as dependent variables.

Conclusions

Null hypothesis Ho1 was rejected because statistically significant differences existed between the attitudes of supervisors and non-supervisors regarding the quality cultural variables, Positive Outlook and Work Enhancement. Null hypothesis Ho2 was rejected because statistically significant differences existed between the attitudes of GS12s and, GS1-7s administrative and GS5-11s, regarding the quality cultural variable, Management. Null hypothesis Ho3 was not rejected because statistically significant differences did not exist among the attitudes of the categorical groups within the independent and control variables regarding the TQM variables.

Null hypothesis Ho4 was rejected. For the dependent variables TQM1 and TQM3, Understand TQM Concept and TQM Leads to Positive Results, multiple regression of the composite variables showed that Organizational Communication had predictive value. Also, Organizational Communication combined with Help Individuals as predictive measures of TQM2, TQM Improves the Work Place. Ho5 was rejected, because the control variable, Education, was shown to have predictive value for TQM1, Understand TQM Concept. No other independent or control variables were shown to have predictive value.

Implication of Rejecting H₀₁. Supervisors attitudes toward the variables Positive Outlook and Work Enhancement were significantly more positive than the attitudes of non-supervisors. This finding somewhat contradicts the reports cited in Chapter 1 (p.6) which claimed that middle managers are becoming as disgruntled as line-workers due to changes designed to increase competitiveness. The argument runs that the loss of traditional authority and down-sizing of firms places the most burden on middle managers to adapt. Surprisingly, the evidence here seems to indicate otherwise.

The variable Work Enhancement involves the concept of job design, or job enrichment. Apparently, supervisors in this sample feel that their jobs utilize their skills in a variety of ways that they find rewarding. Most likely, this contributes to feelings of job satisfaction and motivation which accounts for their positive attitude on the variable Positive Outlook. In contrast, non-supervisors find their work less varied and challenging, and consequently their outlook is less positive.

There are several implications of this finding for the TQM implementation process. First, in keeping with the reports mentioned earlier, the difference between attitudes of supervisors and non-supervisors may indicate that the organization has not successfully implemented TQM. Supervisors remain happy and non-supervisors remain unhappy, because TQM has not changed the status quo. The

satisfaction of supervisors might ironically be a sign that TQM has not progressed far enough. On the other hand, the difference in attitudes of the two groups may indicate the partial success of TQM implementation. The attitude of supervisors may reflect their adoption and acceptance of TQM, but non-supervisors may be resistant to TQM. Of course, the difference between the groups may be due to an extraneous factor other than TQM.

Implication of Rejecting Ho2. The attitudes of GS12s were significantly lower than that of GS1-7s administrative and GS5-11s with regard to the variable Management. Lower grade civilian employees have a better opinion of management than middle grade civilian employees. This is an interesting distinction, because for the "QX" organization both groups should be predominately non-supervisors. The grades in "QX" are rather high, so most GS12s would be at the journeyman level. Though low and middle grade civilians are part of the non-supervisory group which scored low regarding Positive Outlook and Work Enhancement, the low grade civilians view management highly.

Because the variable Management consists of the criterion variables, Confidence in Management, Readiness for Change, and Satisfaction with Supervisors, it measures ones belief that management is capable of implementing TQM. The implication is that the GS12s lack confidence and faith in management and therefore they are more resistant to

initiatives like TQM. On the other hand, the lower grade civilians are more favorable to management and more likely to support TQM.

Implication of Not Rejecting Ho3. None of the demographic variables studied had statistically significant differences regarding the three TQM variables. There is no apparent reason to believe that TQM is not generally accepted in the organization.

Implication of Rejecting Ho4. Two of the composite variables tested as predictors of at least one of the TQM variables. The variable Organization Communication was shown to have predictive value for all three of the TQM variables. The variable Help Individuals had predictive value for TQM2, TQM improves the work place. The regression using composite variables revealed that organizational communication and employee empowerment are key cultural factors associated with attitudes toward TQM.

Implications of Rejecting Ho5. One of the demographic variables tested as a predictor of at least one of the TQM variables. The variable Education proved to be a predictor of TQM1, Understand TQM Concept. The ANOVA analysis of Ho3a supports this predictive correlation, because the rank ordered means were almost sequential with the grouping by education level (Table 19, p.83). However, one must remember that none of the groups tested as significantly different for Ho3a. The predictive value of the demographic

variable Education implies that TQM training needs to be tailored to the different educational backgrounds of employees.

Overall Implication of Data Analysis. The fact that statistically significant differences between groups were revealed by the survey of the culture, supports the efficacy of using the culture to assess TQM implementation. Individual areas for improving the acceptance of TQM were identified, thereby improving the implementation process. However, the strength of the rejection of the basic hypotheses was somewhat limited. Only two of nine subhypotheses were rejected, leading to the rejection of hypothesis H_{01} . Likewise, only one of nine subhypotheses were rejected, leading to the rejection of hypothesis H_{02} . None of the three subhypotheses were rejected, leading to the failure to reject hypothesis H_{03} . Clearly, the statistical tests did not present overwhelming evidence of significant differences in employee attitudes of the organizational quality culture.

The author was surprised that more groups did not test as statistically significantly different, thereby disproving the implied similarity among groups. Though failure to reject a null hypothesis does not connote the freedom to accept it, the failure to reject the similarity among groups insinuates that a strong uniformity of attitudes exists in the "QX" culture.

The author was also surprised that more of the variables did not test as having predictive value of the TQM measures. Only two of the nine composite variables had some predictive value. Of the demographic variables, one control variable and no independent variables had predictive value. A stronger association between cultural factors and TQM, and between demographic characteristics and TQM, was anticipated.

Several possible explanations for the research results were formulated by the author from the experience and knowledge gained in conducting the research. These interpretations are listed in the following section.

Interpretations of Data Analysis. The following factors are possible explanations for the low number of discrepant and predictive groups:

1. TQM in the "QX" organization has been implemented successfully. The small number of groups which have statistically significant different attitudes argues that the quality culture has been transformed by the successful implementation of TQM.
2. The "QX" organization had a culture congruent with TQM before implementation. Without knowing the cultural attitudes before TQM training and implementation, the observed relations could have already existed.
3. Statistically significant differences were lost by aggregating the data. Differences between groups which

might have appeared on the criterion variables were masked by the reduction to the composite variables.

4. The selection bias of the staff sub-group may have homogenized the sample. Attitudes among the staff sub-group may be more uniform than attitudes among other categories of respondents.

Recommendations

Based on my experience in doing this research project, I offer the following recommendations for additional study, and some advice from lessons learned.

Additional Study. One way to improve upon this research is to use a more complete model to assess the organization's culture. As alluded to in this research, the Quality field talks around the concept of culture, but rarely is definitive. On the other hand, the Organizational Development (OD) field is a rich source for theory and research. Though opinion surveys are an improvement over mere supposition, they too may be limited in scope. Other factors such as reward practices, organizational structure and systems, and leadership style are important to defining an organization's culture.

Another improvement which may be open to some, is to evaluate the culture in a pre-test, post-test situation. Ideally, one would like to know the culture measures of the organization both before and after the introduction of TQM. Then one could possibly make causal inferences about the

affect of TQM implementation or training.

A third recommendation is for a longitudinal study of the cultural change. Because the "QX" organization plans to administer the survey again in January 1991, this option holds much promise to an AFIT student.

A final recommendation, related to the third, is to stay with the original criterion variables. Though the data reduction technique has merit, it may mask statistically significant differences between groups which may be revealing.

Survey Instrument. Though the survey was designed by "QX" personnel to meet their needs, I offer the following suggestions as possible improvements.

1. Divide the categories of military rank and civilian grades into more meaningful segments. Some of the categories are too broad to interpret who is being measured.

2. Add a question asking if the individual is assigned to the staff sub-group or the matrix sub-group.

3. List all possible organizations and allow a free response for any exceptions.

4. Remove ambiguity of categories on the variable Aeronautical Rating, or eliminate it completely.

5. Include a variable asking the respondents age.

6. Include a variable asking the respondents gender.

7. Ask more questions about attitudes toward TQM.

Sampling Technique. Without wanting to belabor the point, the sample must be representative of the population in order to draw valid conclusions from the data about the population. Otherwise the results are limited to the sample and can not be extrapolated. The methodology of analysis must be planned up-front to ensure the sample selection process will yield the proper data.

Another point, which may not be intuitively obvious, is worth mentioning. For a given confidence interval, as the population decreases the calculated sample is a relatively larger percentage of the population. In other words, the fewer people in the population the greater percentage of them must be sampled to ensure the same reliability.

Appendix B: Organizational Culture Survey

USAF SCN 90-02
EXPIRES 30 JUNE 90

"QX"
ORGANIZATIONAL CLIMATE SURVEY
PRIVACY ACT STATEMENT

- a. Principle Purpose. The survey is being conducted to assess the organizational climate within (directorates) falling under the responsibility of the Deputy for "QX". The survey data will be used to establish comparative information concerning directorates under the Deputy "QX". Additionally, directorates can use the data to assess strengths and weaknesses within their own organizations.
- b. Participation in this survey is entirely voluntary.
- c. No adverse action of any kind may be taken against any individual who elects not to participate in this survey.

YOUR RESPONSES TO THIS SURVEY ARE CONFIDENTIAL AND WILL REMAIN ANONYMOUS. AT NO TIME WILL ANY ATTEMPT BE MADE TO DETERMINE HOW YOU, AS AN INDIVIDUAL, RESPONDED TO THESE QUESTIONS.

GENERAL INSTRUCTIONS

1. The following questions are designed to measure your perceptions and your reactions to your job and how it affects you. Be totally candid and try to give your honest opinion, not that of your friends or what you feel "the people on top" want to hear. This is your chance to express the way you feel.

2. Section 1 will ask you to provide some information about yourself. The questions are there only to provide relevant information to generate statistics based on various groups. NO ATTEMPT WILL BE MADE TO IDENTIFY HOW YOU, AS AN INDIVIDUAL, RESPONDED TO THESE QUESTIONS. We will not report data which allows for the possibility of identifying the individual respondent because of the category they are in (e.g. female GS-12). Your commander, director, or immediate supervisor will not preview or obtain your individual answer sheets unless you give it to him/her. All completed response sheets will be sent through distribution to the same destination regardless of your unit. Your answers will be kept confidential.

3. All statements may be answered by filling in the appropriate space on the response sheet. If you do not find the exact response that reflects your opinion, use the one closest to it. Please mark your answers on the answer sheet that is provided.

4. The response sheet is designed for machine scanning of your responses. Please use a number 2 pencil and observe the following requirements:

- Make heavy black marks that fill the appropriate spaces
- Erase cleanly any answers you wish to change
- Make no stray marks of any kind on the answer sheet
- Do not staple, tear or fold the answer sheet

Below is a list of key words and their definitions as they are used in this survey:

IMMEDIATE SUPERVISOR: The person who supervises your day-to-day activities.

WORK GROUP: The people who report to the same immediate supervisor as you do or those with whom you work on a daily basis.

CHAIN OF COMMAND: The levels of management above you, including your division or directorate head and above.

CIVIL SERVICE: All appropriated civilian employees.

DIRECTORATE/ORGANIZATION: The three letter in which you work.

Please provide the letters of your office symbol. If your office symbol is less than five letters, leave blanks on the answer sheet for the remaining letters.

1. _____ First letter of office symbol.
2. _____ Second letter of office symbol.
3. _____ Third letter of office symbol.
4. _____ Fourth letter of office symbol.
5. _____ Fifth letter of office symbol.

e.g., If your office symbol is ABCD,

mark "A" in response 1 on answer sheet,

mark "B" in response 2 on answer sheet,

mark "C" in response 3 on answer sheet,

mark "D" in response 4 on answer sheet,

leave response 5 blank on the answer sheet.

6. How long have you been a member of this organization?

- a. Less than 1 year.
- b. 1-2 years.
- c. 2-3 years.
- d. 3-4 years.
- e. More than 4 years.

7. To which group do you belong?

- a. O-1, O-2, O-3
- b. O-4, O-5, O-6
- c. E-1 through E-6
- d. E-7, E-8, E-9
- g. GS 1-7 (administration and clerical)
- h. GS 5 through GS 11
- i. GS 12
- j. GS/GM 13-14-15, SES

8. Are you a supervisor in your present job (i.e. do you provide day-to-day direction to other employees)?

- A. YES.
- B. NO.

9. What level of formal education have you completed?

- A. Less than high school
- B. High School graduate
- C. Some college
- D. Bachelor's degree
- E. Some graduate work
- F. Master's degree or equivalent
- G. Some doctoral work
- H. Doctorate or equivalent

10. What is your aeronautical rating?

- A. Not rated
- B. Pilot
- C. Navigator
- D. Other
- E. Civilian
- F. Can't answer/does not apply

11. Which command do you work for?

- A. AFSC
- B. AFLC

SECTION 2

Please use the scale shown below to respond to the statements that follow:

- | | |
|-------------------------------|-------------------------------|
| A. Strongly disagree | E. Slightly agree |
| B. Disagree | F. Agree |
| C. Slightly disagree | G. Strongly agree |
| D. Neither agree nor disagree | H. Can't answer/doesn't apply |

12. Information is usually widely shared in my directorate so that those who make the decision will base their decisions on the best available know-how.

13. In looking back, it is difficult to point to my accomplishments on the job.

14. I have confidence and trust in the persons who work with me and report to the same immediate supervisor that I report to.

15. Since I have been in my directorate I have done more than I thought I would do.

16. For most situations, I have confidence and trust in the people above me in the chain of command.

17. My ability is recognized by the people above me in the chain of command.

18. I feel free to give suggestions to my supervisor about improving or changing things in the directorate.

19. I know exactly what is expected of me in performing my job.

20. My job requires me to do many different things, using a variety of my talents and skills.

21. Bottlenecks in my organization seriously affect the flow of work to or from my group.

22. I feel that the lowest level supervisors in my directorate usually have enough say or influence about policies.

23. Most of the time I get a feeling of achievement from my job.

Please use the scale shown below to respond to the statements that follow:

- | | |
|-------------------------------|-------------------------------|
| A. Strongly disagree | E. Slightly agree |
| B. Disagree | F. Agree |
| C. Slightly disagree | G. Strongly agree |
| D. Neither agree nor disagree | H. Can't answer/doesn't apply |

24. The people who report to the same immediate supervisor that I do are friendly and easy to approach.

25. In general, I decide for myself how to accomplish a job.

26. The people in my directorate seem to get maximum output from the resources (money, people, equipment, etc.) they have available.

27. My job provides the opportunity for my career to grow.

28. Additional duties interfere too much with my primary job performance.

29. In my job I use my civilian/military education and training.

30. The quality of performance in this directorate is very high.

31. In my job I have the chance to feel I am accomplishing something.

32. The amount of effort that people in this directorate put into their job is very high.

33. In my directorate workers who do not supervise others have an adequate amount of say or influence about policies.

34. My chain of command is supportive of my desires to pursue additional training or advanced degrees.

35. My job involves doing a whole task or a task from start to finish.

36. I have adequate tools, procedures and equipment to accomplish my job.

37. For the most part, I have no impact on the development of work objectives. They are announced with no opportunity to participate or contribute.

Please use the scale shown below to respond to the statements that follow:

- | | |
|-------------------------------|-------------------------------|
| A. Strongly disagree | E. Slightly agree |
| B. Disagree | F. Agree |
| C. Slightly disagree | G. Strongly agree |
| D. Neither agree nor disagree | H. Can't answer/doesn't apply |

38. The people I work with and who report to the same immediate supervisor I do work together effectively as a team.

39. The supervisors in my directorate are capable of performing effectively under stress.

40. When I do a good job I can expect praise from my immediate supervisor.

41. I have a say in setting the work goals in my directorate.

42. The quality of work produced by the people in my directorate is not too good.

43. My job is significant, in that it affects others in some important way.

44. I understand the roles and relationships between the "QX" staff and matrix organizations.

45. The amount of work space I have been provided is adequate.

46. I do not feel there is much similarity between my abilities and the requirements of my job.

47. The people whom I work with and who report to the same immediate supervisor that I do receive little information about what is going on in other divisions.

48. In my job, I make a meaningful contribution to my directorate.

49. People in this organization are held accountable for producing quality work.

50. You are held accountable for producing quality work.

51. I have received the training I need to perform well in my job.

Please use the scale shown below to respond to the statements that follow:

- | | |
|-------------------------------|-------------------------------|
| A. Strongly disagree | E. Slightly agree |
| B. Disagree | F. Agree |
| C. Slightly disagree | G. Strongly agree |
| D. Neither agree nor disagree | H. Can't answer/doesn't apply |

52. My immediate work group responds to customer concerns about quality.

53. Higher management is quick to see the value of new ideas and technology.

54. My organization encourages reasonable risk taking to improve performance.

55. My fellow workers know what their jobs are and know how to do them well.

56. The people above me in the chain of command care about what happens to me.

57. The overall quality of the supervision I have received in my work is poor.

58. Generally speaking, I am satisfied with my job.

59. The people above me in the chain of command do not understand the problems I face in doing my job.

60. Most of the time my directorate accomplishes its mission requirements.

61. My work assignment is challenging.

62. My efforts lead to positive results.

63. Since I have been in my directorate I have done more than I thought I could do.

64. I feel that I have the chance to "grow" in my job.

65. My directorate usually recognizes good performance.

66. I am able to determine how well I am doing my job without feedback from anyone else.

67. I am given the opportunity to make decisions for myself.

Please use the scale shown below to respond to the statements that follow:

- | | |
|-------------------------------|-------------------------------|
| A. Strongly disagree | E. Slightly agree |
| B. Disagree | F. Agree |
| C. Slightly disagree | G. Strongly agree |
| D. Neither agree nor disagree | H. Can't answer/doesn't apply |

68. I frequently think about quitting this job or asking for a transfer.

69. My directorate is not sensitive to the problems of the individual.

70. My job gives me a chance to "dig deeper" into the work activities which interest me.

71. Morale in my directorate is good.

72. My immediate supervisor has discussed my career development with me.

73. My present assignment to "QX" does not give me the chance to do the kind of work I do best.

74. My job provides the chance to know for myself when I do a good job, and to be responsible for my own work.

75. My job provides no new challenges.

76. I generally decide the work methods and procedures for my job.

77. I am more concerned about the final 'product' my customer receives than the 'process' I use.

78. I understand the mission of "QX".

79. The people I work with, who also report to the same immediate supervisor as I do, are usually aware of important events and situations.

80. The people in my directorate do a poor job in anticipating problems and preventing them from occurring.

81. When decisions are being made in my directorate the persons who will be affected most are asked for their ideas.

82. I am usually given the opportunity to present the results of my work to others.

83. Doing my job well affects a lot of people.

Please use the scale shown below to respond to the statements that follow:

- | | |
|-------------------------------|-------------------------------|
| A. Strongly disagree | E. Slightly agree |
| B. Disagree | F. Agree |
| C. Slightly disagree | G. Strongly agree |
| D. Neither agree nor disagree | H. Can't answer/doesn't apply |

84. My job provides me with the chance to completely finish the piece of work I have begun.

85. My job requires me to use a number of complex skills.

86. My job does not give me much opportunity for recognition.

87. My supervisor is willing to help me achieve my personal and career objectives.

88. I am generally satisfied with the kind of work I do in my job.

89. I am happy with the amount of support and guidance I receive from my immediate supervisor.

90. My director is concerned about my career development.

91. I would like to be selected to go back to school for additional training or an advanced degree (Masters or PhD.).

92. My experience has been that a staff member's judgment is trusted by those above him/her.

93. My workload is greater than other directorate members.

94. Having been at "QX" will help me get a better job when I leave.

95. Filling out this survey is a good way for employees to let management know what they think.

96. Improvements have occurred as a result of previous surveys.

97. We will discuss the results of this survey in our directorate.

98. Results from surveys such as these are used constructively in this organization.

99. Communication among "QX" directorates is good.

Please use the scale shown below to respond to the statements that follow:

- | | |
|-------------------------------|-------------------------------|
| A. Strongly disagree | E. Slightly agree |
| B. Disagree | F. Agree |
| C. Slightly disagree | G. Strongly agree |
| D. Neither agree nor disagree | H. Can't answer/doesn't apply |

100. Innovation and risk taking are encouraged in this organization.

101. My work group has good communication with their customers.

ADDITIONAL PECULIAR "QX" QUESTIONS

102. Higher management is resistant to change.

103. I understand how to submit a Search for Opportunity (SFO) into the "QX" TQM system.

104. I understand the concept of Total Quality Management (TQM).

105. I believe the TQM process will make "QX" a better place to work.

106. I have personally seen positive results from Total Quality Management.

107. I feel more communication and interaction is needed between the matrix organizations and the "QX" staff.

108. I feel that I am a valuable part of the matrix organization.

109. I feel that I am part of the Logistics community ("QX", ALD, AFLC).

NOTE: An additional 24 questions were asked of the respondents but were not included in the analysis. Nineteen of these questions were a follow-on to a 1988 survey by the contractor who performed the TQM training. The randomness of that original survey was questionable and, according to the current survey, the data was sought "... in order to get a 'general' feeling of improvement or decline in the organizational climate...". The remaining five questions had not been officially approved by AFMPC and were asked "... on a voluntary basis..." for additional general information. These 24 questions were considered ancillary to the principal measurements being researched.

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[REDACTED] 1990 [REDACTED]

[REDACTED]

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE September 1990	3. REPORT TYPE AND DATES COVERED Master's Thesis	
4. TITLE AND SUBTITLE EMPLOYEE ATTITUDES OF THE ORGANIZATIONAL CULTURE: ASSESSMENT OF A TQM IMPLEMENTATION PROCESS			5. FUNDING NUMBERS	
6. AUTHOR(S) Thomas J. Stout				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Air Force Institute of Technology, WPAFB OH 45433-6583			8. PERFORMING ORGANIZATION REPORT NUMBER AFIT/GLM/LSQ/90S-57	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) This study investigated whether a survey of employee attitudes of the organizational culture yielded a worthwhile assessment of TQM process implementation. Given the assumption of TQM requiring cultural transformation, the culture should reflect the progress of TQM implementation. A literature search indicated attitudes should differ among groups within an organization. Data was extracted from, a TQM familiar, Air Force organization's survey of 170 members. Through data reduction, nine composite variables of quality culture and three variables of TQM were identified. ANOVA, t-tests, and regression analyses using various combinations of groups and variables were performed. Statistically significant differences were found between supervisors and non-supervisors regarding cultural variables Positive Outlook and Work Enhancement. GS-12s differed from GS1-7s Administrative and GS5-11s regarding the variable Management. The variables Organizational Communication, Help Individuals, and Education had predictive value to various TQM variables. Areas for improvement of TQM implementation were identified, but results were mixed. Confounding factors were discussed and further research was recommended. (KAC)				
14. SUBJECT TERMS Quality Assurance, Quality Control, Culture, Social Sciences, Total Quality Management, TQM, Organization Development			15. NUMBER OF PAGES 134	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL	